MARCH 15, 1945

American Machinist

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Magnetic-Particle Testing Stations Reveal Surface Defects Rapidly

•

Finishing Recoil Cylinders for Navy Guns

•

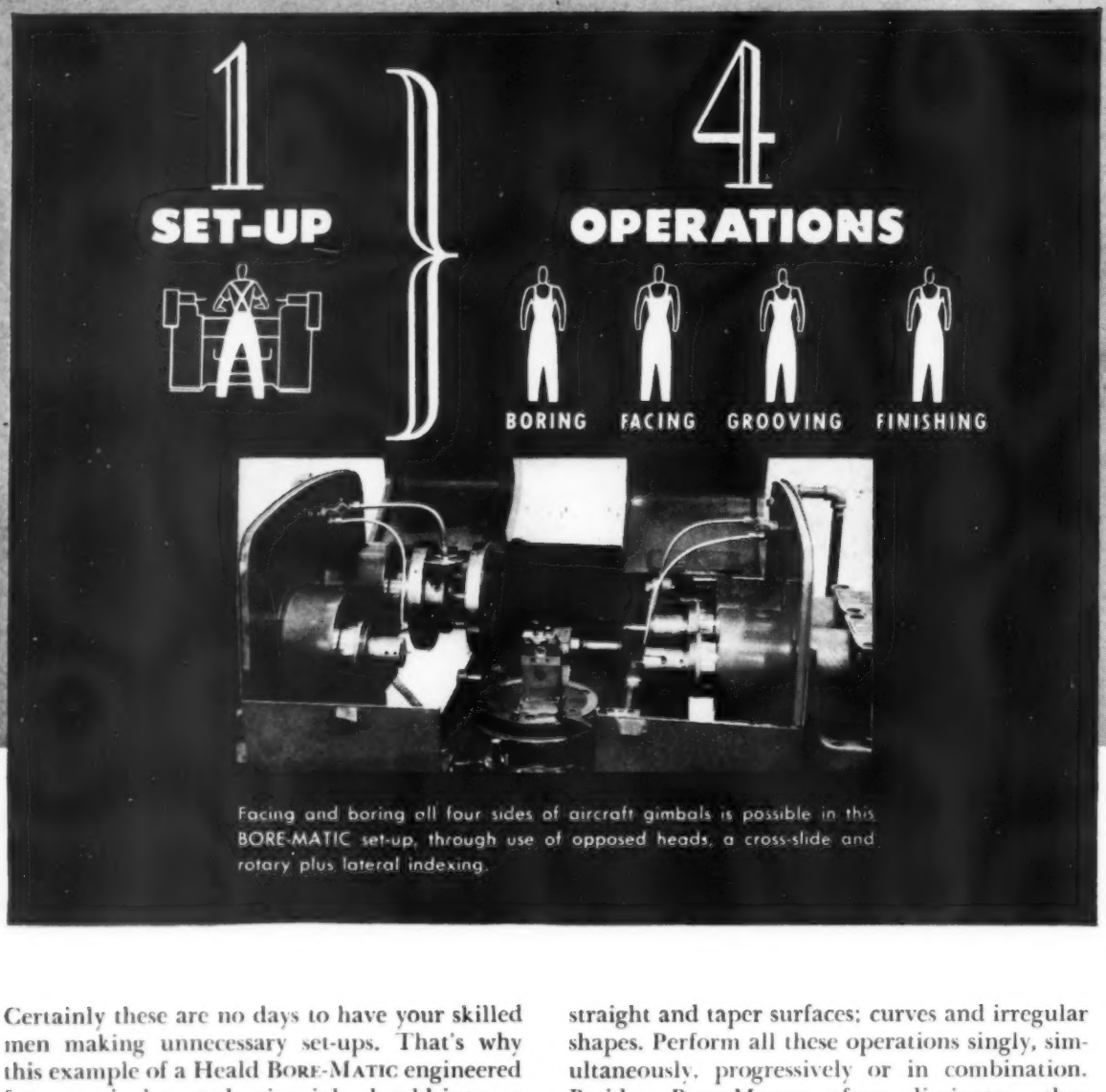
Welding Requirements For Various Stainless Steels

•

Clearance and Relief Angles Of Milling Cutters

- *Pre-Termination Agreements on War Contracts*
- *Opportunities and Challenges of Surplus Property*
- *Partial Payments on Terminated Contracts*
- *'Sparkplug' Termination Unit*

MULTIPLY *Your* MANPOWER WITH A BORE-MATIC!



Facing and boring all four sides of aircraft gimbals is possible in this BORE-MATIC set-up, through use of opposed heads, a cross-slide and rotary plus lateral indexing.

Certainly these are no days to have your skilled men making unnecessary set-ups. That's why this example of a Heald BORE-MATIC engineered for a particular production job, should interest you. It permits making 1 set-up do for as many as 4 precision operations.

More operations per set-up boosts production. But more than that, with a BORE-MATIC you get improved relative accuracy of multiple surfaces. You decrease down time. Floor space is conserved. All-round versatility permits your BORE-MATIC to handle boring, turning, facing, chamfering, grooving, and fly-cutting. You can machine straight and taper surfaces; curves and irregular shapes. Perform all these operations singly, simultaneously, progressively or in combination. Besides, BORE-MATICS often eliminates other finishing operations. They also can be used for roughing and semi-finishing.

Even if you think you know the BORE-MATIC story—let us bring you up to date on it. You'll find BORE-MATIC performance facts pretty convincing proof that it is the precision answer to faster, better, less costly volume production.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

HEALD

means more precision faster!

INTERNAL AND SURFACE GRINDING MACHINES
BORE-MATIC PRECISION FINISHING MACHINES

TECHNOLOGY DEPT

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★ New Title or Position _____

Coming Up . . . In the March 29 issue of *American Machinist*, you should be sure to read:

How Westinghouse, unable to obtain involute spline gages, made gages out of available equipment; proper machining methods on glass-reinforced plastics; magnetic particle testing article, based on a symposium held recently and conducted by authorities in that particular field; methods for assembling steam and gas turbine wheels and compressor disks by welding; production trouble-shooting on the B-29 bomber.

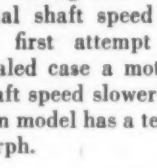
In the News . . . Here is a quick look at a few recent Metal-Working developments:

General Electric, in releasing some details of its turbo jet airplane engine, comments: "Most mechanics are surprised to learn that there are only 11 bolts holding the engine in place. Only two main bearings and one shaft in the engine itself. A maintenance job requiring five days on a conventional plane can be done on a jet in a day."

Ajax-Hultgren Electric Salt Bath Furnaces, recently installed in a large mid-western plant for isothermal heat-treatment of special ordnance parts, represent the deepest salt baths constructed to date. A depth of 7 ft.!

A process of automatic carbon arc welding, perfected by Lincoln Electric, is said to be the only method by which vitally needed aluminum parts for military bridges can be fabricated on a mass scale.

Warren Telechron Company has developed a new timing and control motor with terminal shaft speed of 1 rph—Telechron's first attempt to enclose within a sealed case a motor having a terminal shaft speed slower than 1 rpm. A companion model has a terminal shaft speed of 3 rph.



Please Note . . . We'd like to add our little reminder that during March the American Red Cross is conducting its Annual War Fund Campaign. Enough said!

American Machinist Chips

Fifty Years Young . . . Six hundred employees of the Vlchek Tool Company of Cleveland recently dined to honor Frank J. Vlchek, President and Founder, on the 50th Anniversary of the founding of the company.

Starting and growing with the automotive industry, the firm is active today in several types of war work. When the shooting is over, Vlchek plans to expand its service tools business and also to supply customers with a line of molded plastic articles.

Rebuttal . . . Some time ago we received the following letter from one of our old-time subscribers:

"When I opened the December 7 issue of the American Machinist *at the first article, on the Super-Fortress, I was rather astonished to see that you were perpetuating a mathematical error that has persisted in all of the Boeing publicity of that magnificent plane.*

"In the second paragraph on page 89, you say,—'It is half as big again *(or half again as big) as the Flying Fortress', and then proceed to give the dimensions of the two ships. Even these dimensions are not in the ratio of 1½ to 1. The wing spread is 37% longer, the height 47% greater and the length 32%, which you might say averages 33 1/3% greater.*

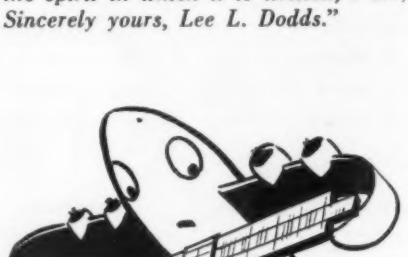
"That is all right as far as dimensions go, but in mechanical engineering, when we speak of size, we mean cubical *contents. If the cubical contents are increased 50%, it would require an increase in dimensions of approximately 12½%.*

"However, if we increase the dimensions 50%, we would have nearly four times the volume. If we increase the dimensions by 33 1/3%, we more than double the volume. (Figure it out)

"This is proven by the fact that the B-29 weighs about twice as much as the B-17 and will carry twice the load and fly twice as far. (I worked all this out with the help of Colvin and Stanley's handbook, which I purchased in 1909.) (As though I didn't know how to do it.)

"I have no objection to Boeing making a mistake in their publicity, but I thought that an engineering magazine, with the reputation and background of American Machinist, *should not make such a mistake. I have held your magazine in high regard for over 40 years and have contributed to its columns several times.*

"Trusting that you will accept this in the spirit in which it is written, I am, Sincerely yours, Lee L. Dodds."



Wanting to retain Mr. Dodds' high regard, as well as to verify the accuracy of our editorial content, one of our editors dug into the matter and makes the following comment:

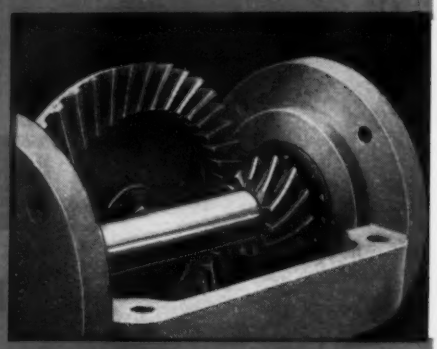
"It depends on your point of view. The fact of an increase of 37% in airfoil span does not mean an increase of more than double the swing volume because the chord and depth of the section has not been increased to the same extent. This also holds true for fuselage length. The increase of 47% in ground height is not related to cubic displacement inasmuch as it is principally related to swing clearance for the 16.5 ft. props, and is materially taken up in oleo length.

"If the reasoning expressed in the letter is logically extended, it would be safe to say the B-29 is four times as large as the B-17 because it carries twice the load twice as far."

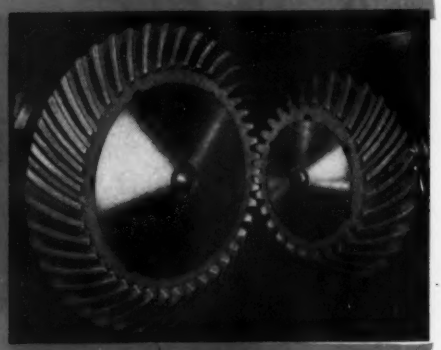
Any comments or triple checks on the above will be welcome.

WHY GIVE BEVEL GEARS *A Running Test?*

Gleason
No. 13 Universal Gear Testing Machine



Spiral bevel gears in final mountings showing actual tooth contact



Spiral bevel gears in Gleason Testing Machine showing desired tooth contact for proper operation of gears in final mountings

Bevel gear users must know how their gears will operate in their final mountings. Gleason testing machines provide a practical method of insuring that the gears are right before expensive assembly. In these testers the gears are rigidly mounted in the correct operating position and run under power and brake load. By means of machine adjustments it is possible to determine how the gears will operate in and out of position in their final mountings.

Tooth size, pronounced run-out and tooth spacing error, smoothness and quietness of operation, and actual tooth contact under load (known as tooth bearing) are all checked by the running test. This test is important for all types of gears, but it is essential for the tapered teeth of bevel gears, which can not be checked for shape in any other practical manner.

In all stages of gear manufacture the running test gives a positive indication of how the gears will operate in their final mountings. This check is invaluable:

Before Production — to determine correct set-up of gear cutting machine.
During Production — to maintain uniform quality of the production gears.
Final Test — to find the best running position of the gears for assembly.
— to eliminate "fitting" or "tearing down" and rebuilding of an assembly, because the gears are not right. Substantial savings in time and expense result.

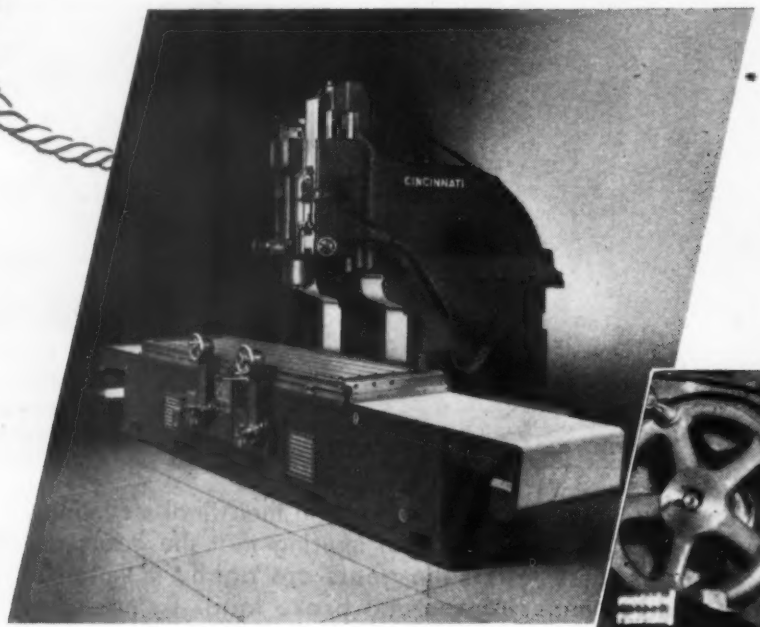
GLEASON Works
Builders of BEVEL GEAR MACHINERY FOR OVER SEVENTY-FIVE YEARS

Send in prints of your gears to the Gleason Works. We will be glad to recommend the testing machine best suited to your needs. The Gleason Works, Rochester 3, New York, U. S. A.

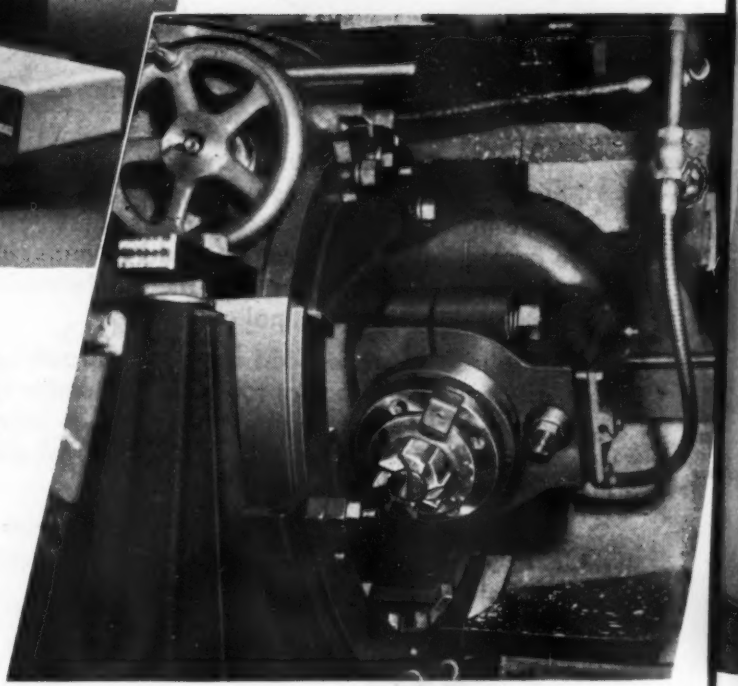
WITHOUT RESETTING THE

ATTACHMENT ON HYDRO-TEL

IN *SEAGOING* BEARINGS



Below: *Close-up of the actual milling operation. Nine slots are milled in this seagoing bearing without resetting the work. The setup provided a highly satisfactory solution for a slow and tedious machining operation.*



Above: *The* CINCINNATI *28" series Vertical Hydro-Tel Milling Machine. Complete specifications may be obtained by writing for Catalog M-1018-2. Sweet's Catalog File gives a brief description.*

CINCINNATI

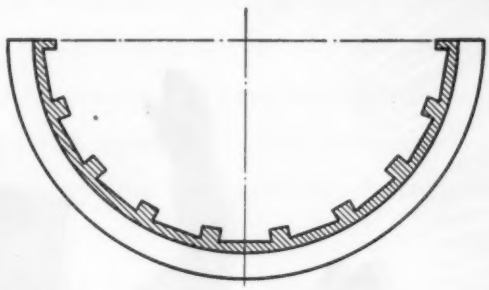
Keep on buying WAR BONDS

THE CINCINNATI M

MILLING MACHINES

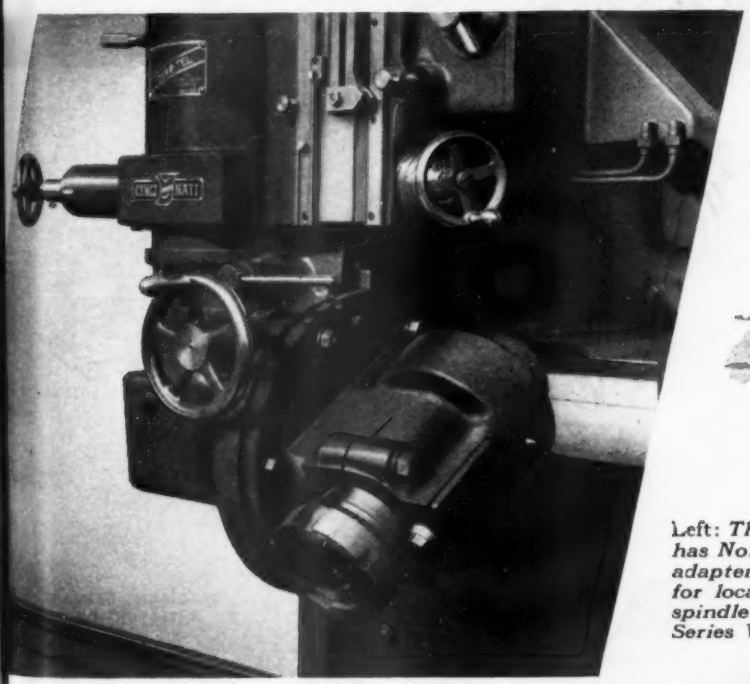
WORK . . .

MILLS NINE SLOTS

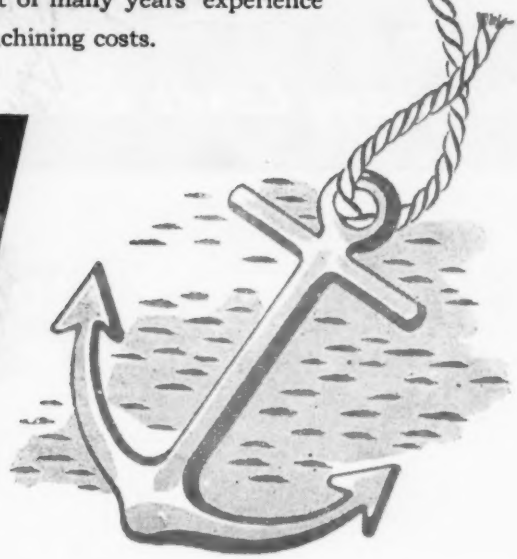


One of the many difficult machining operations for shipbuilders was that of cutting dovetail slots in propeller shaft struts. Conventional methods involved resetting and realigning the work several times; a slow process for the most expert machinist. Cincinnati Application Engineers went to work on the problem and designed a Universal Milling Attachment for a 28" Vertical Hydro-Tel Miller, which milled *all the slots* at *one setting of the work.*

Considering the size of the part (one of them is shown above) just think of the time saved on this one operation and the physical effort eliminated by doing the job on an easy-to-run Hydro-Tel. ¶ The entire setup is one of many developed by Cincinnati Application Engineers. This group of authorities will be glad to talk to you about your milling operations, and give you the benefit of many years' experience in reducing machining costs.



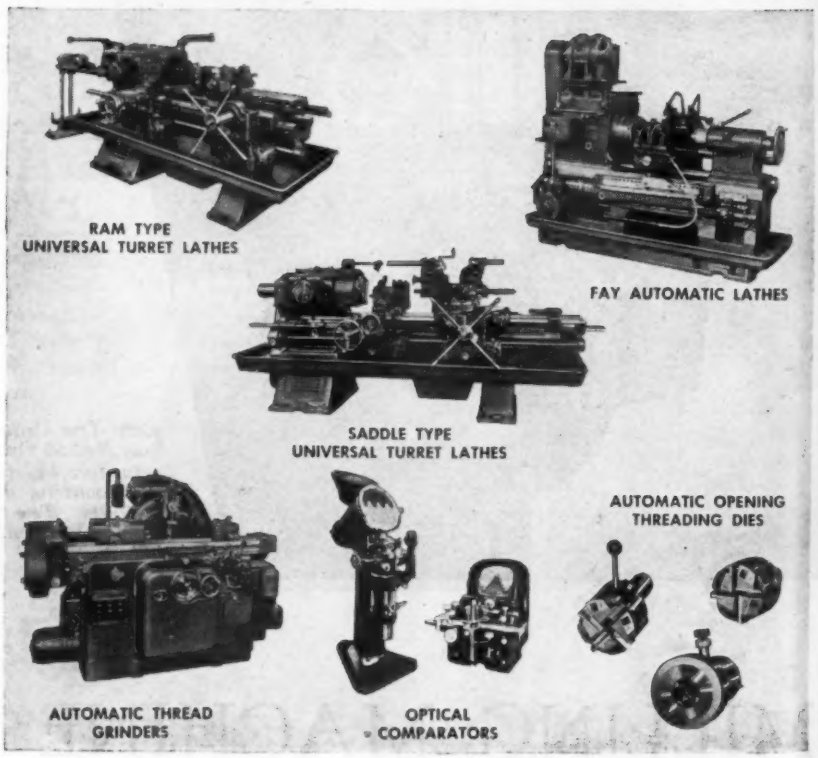
Left: The Universal Index Milling Attachment has No. 50 standard taper hole; quick change adapter; 1½ to 1 speed ratio, and index plate for locating angular position of attachment spindle. The machine is a CINCINNATI *28" Series Vertical Hydro-Tel Miller.*



MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

How many hands does a turret lathe operator need?



JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Many a turret lathe operator must have wished, at times, that he were like the six-armed deity of the Hindus, for faster-cutting tools have greatly increased the productivity of these machines and the burden upon the operator. The necessity for simplified controls to save waste motion and operator fatigue is, therefore, imperative!

Jones & Lamson Universal Turret Lathes are designed not only to take full advantage of the fastest-cutting tools, but also to give every mechanical aid to the operator so that he can operate to the maximum capacity of the machine without undue fatigue.

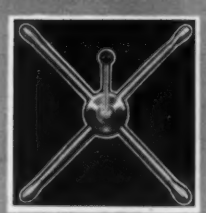
We show here some of the man-saving, time-saving features built into these machines. Write to us for more detailed information and descriptive literature.

— only two — if it's a Jones & Lamson

SINGLE LEVER SPINDLE SPEED SELECTOR

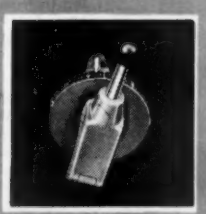
With direct reading dial, to control all spindle speeds. Next speed pre-selected while cut is in progress.

POWER TRAVERSE AND INDEXING OF THE HEXAGON TURRET



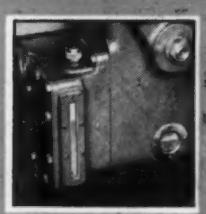
Turret of saddle type machines is power traversed and power indexed. A time saver and man saver too.

SINGLE LEVER FEED SELECTORS



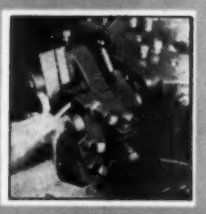
Controlled by single lever, direct reading, selectors. Feeds pre-selected while cut is in progress.

AUTOMATIC LUBRICATION SYSTEM



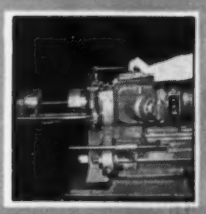
Requires minimum of attention. Flow of lubricant automatically increases as spindle speed increases.

AUTOMATIC COOLANT SUPPLY TO HEXAGON TURRET



A copious supply of coolant is pumped automatically to the working face of the hexagon turret.

SIMPLIFIED BAR FEED AND COLLET OPERATING MECHANISM



Operated by a single lever, which opens chuck, feeds in stock and closes chuck.

All these features and many others are incorporated as standard in Jones & Lamson Universal Turret Lathes.

Charted INVOLUTE

PUTS PRECISE READINGS

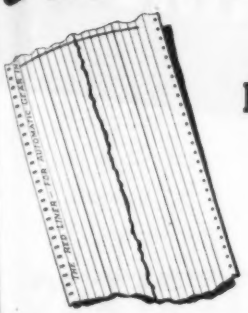
No. 12M Fellows Involute Measuring Instrument for gears up to 12 inches P.D. A larger model for gears up to 24 inches is also available.

By substituting a "gooseneck" pointer, this instrument will check internal gear tooth profiles with the same ease and dispatch as external teeth.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

INSPECTION

"on record"



Fellows Involute Measuring Instrument represents the most practical and accurate means for recording involute profiles.

The Fellows Involute Measuring Instrument operates on a basic principle and dispenses with the customary base rolls, sine bars, and calculations. It is simple in design, easy to set-up and operate, and can be adapted to the checking of different-sized gears with ease and dispatch as illustrated by this 4-step cluster gear.

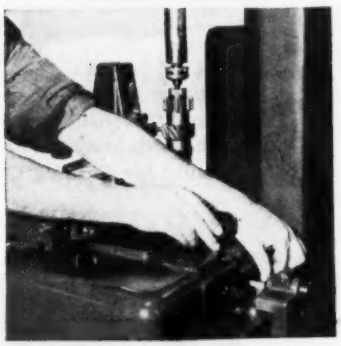
The operation of this instrument is extremely simple. To "roll" an involute the pointer is accurately set by a master gage. Size blocks of the proper dimensions are inserted between the main slide and the stop for setting the involute pointer at the base circle radius. The indicator slide is then traversed by rotating a hand wheel. At the same time the work is automatically rotated in step with the traverse of the slide carrying the involute pointer. Errors in profile can be noted visually on the "one ten-thousandth" dial indicator, or can be charted by the electronic recorder for study or future reference. In addition to checking the involute profile, other elements of the tooth such as tip modification, undercut, high fillet, etc., can be charted and their magnitude and location determined.

This instrument is a highly necessary adjunct to your gear department if you are producing precision gears. For additional information, ask for a copy of our latest circular, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit 2, Michigan—or 640 West Town Office Building, Chicago 12, Illinois.

Fellows

SIMPLIFIED SETTING

1 1.9091 inch P.D. Spur Gear. Set Main Slide with 0.897 inch gage block.



2 2.3182 inch P.D. Helical Gear. Substitute 1.0892 inch gage block.

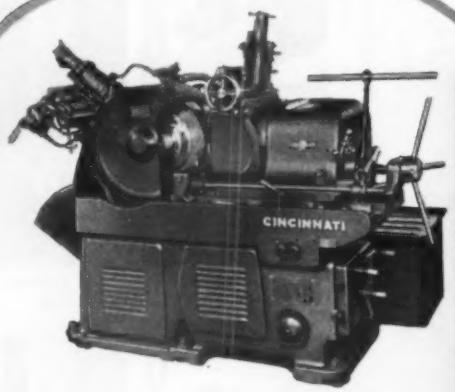
3 3.2727 inch P.D. Helical Gear. Substitute 1.5377 inch gage block.

4 4.0909 inch P.D. Helical Gear. Substitute 1.9221 inch gage block.

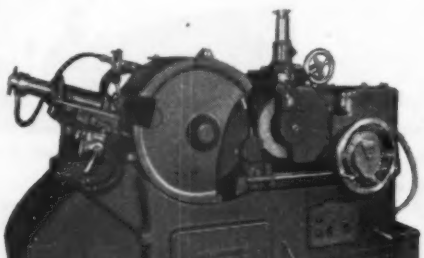
FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

FROM A PIN POINT TO A 9" DIAMETER

ON THE CINCINNATI CENTERLESS

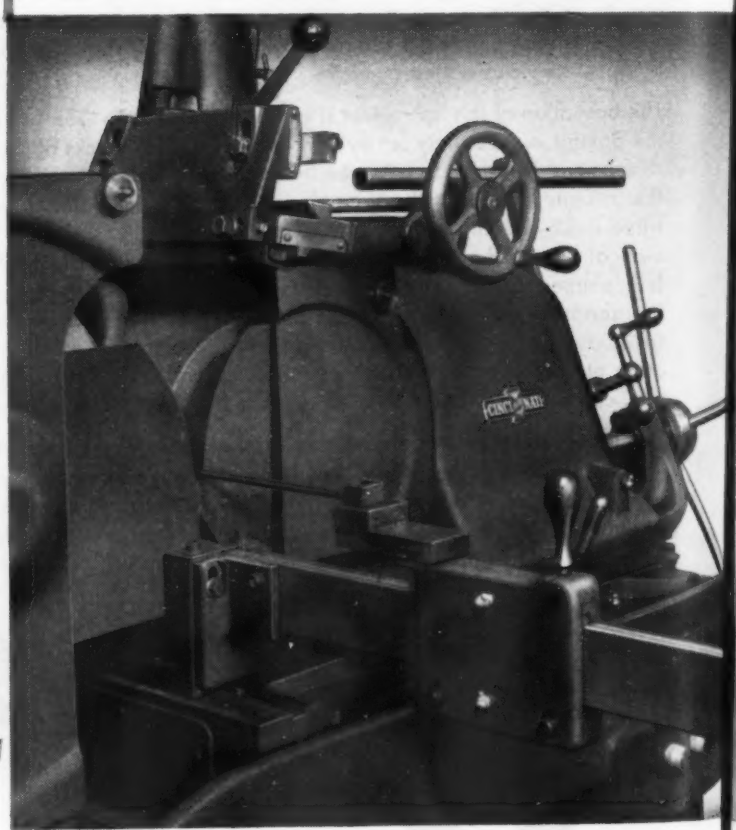


CINCINNATI *No. 2 Centerless Grinding Machine. Complete specifications may be obtained by writing for Catalog G-456-3.*



CINCINNATI *No. 3 Centerless Grinder. Specifications for this machine are contained in Catalog G-438-3. Copy on request.*

CINCINNATI *No. 4 Centerless. Write direct to factory for specifications. A brief description may be found in Sweet's Catalog File.*



Keep on buying WAR BONDS

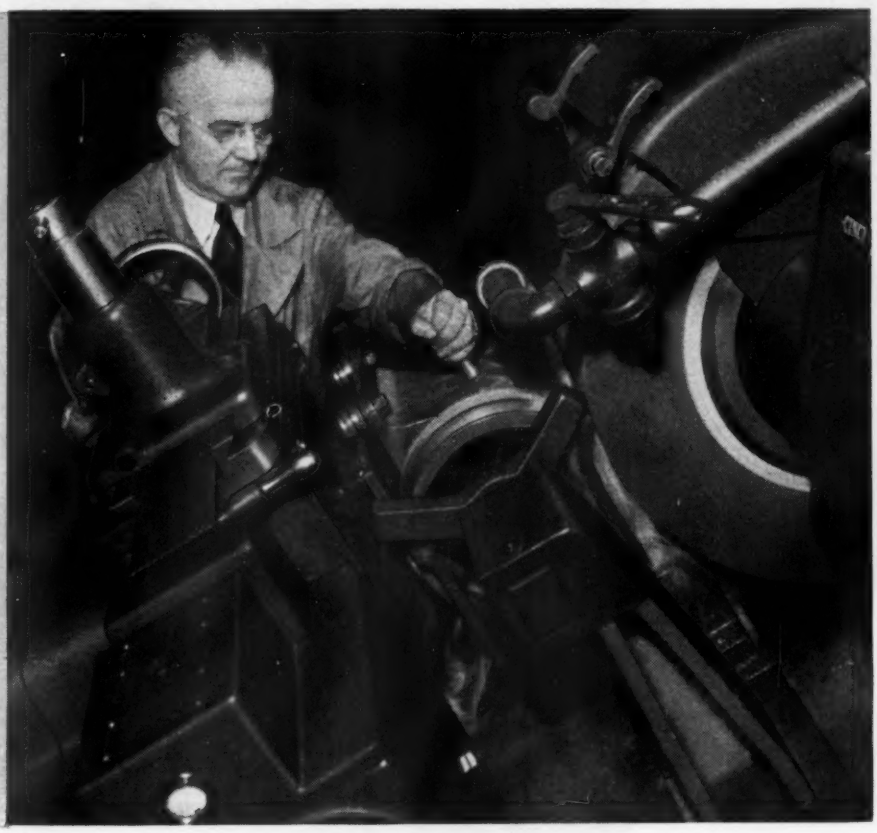
CINCINNATI GR

CINCIN

CENTER TYPE GRINDING MACHINE CENTE

The ability of *standard* CINCINNATI Centerless Grinders to taper textile spindles, grind hypodermic needles right down to a pin point, or to grind diameters up to 9", gives you a good idea of the versatility of these machines. And their usefulness may be judged by their ability to grind accurately, speedily and economically, a wide range of either cylindrical (straight or flanged) or spherical parts made from various types of materials such as metal, rubber, wood, plastics, ceramics, glass, cork and others. You'll be interested in more details about the versatility and productive capacity of CINCINNATI Centerless Grinding Machines. They are available in standard sizes Nos. 2, 3 and 4. Nos. 5 and 6, as well as a size smaller than the No. 2, are built for special work. ¶ Cincinnati Application Engineers have had more than a score of years' experience in the adaptation of the centerless method to difficult grinding operations. Perhaps in your shop some grinding jobs could be handled more efficiently and economically on a CINCINNATI Centerless. Why not talk it over with our engineers?

Left: Grinding the taper on both ends of textile spindles *from the straight bar*. Special equipment includes: pusher type roller infeed work rest; profile truing over grinding and regulating wheels, and 8" wheel mounts. The machine is a CINCINNATI No. 2 Centerless.



CINCINNATI

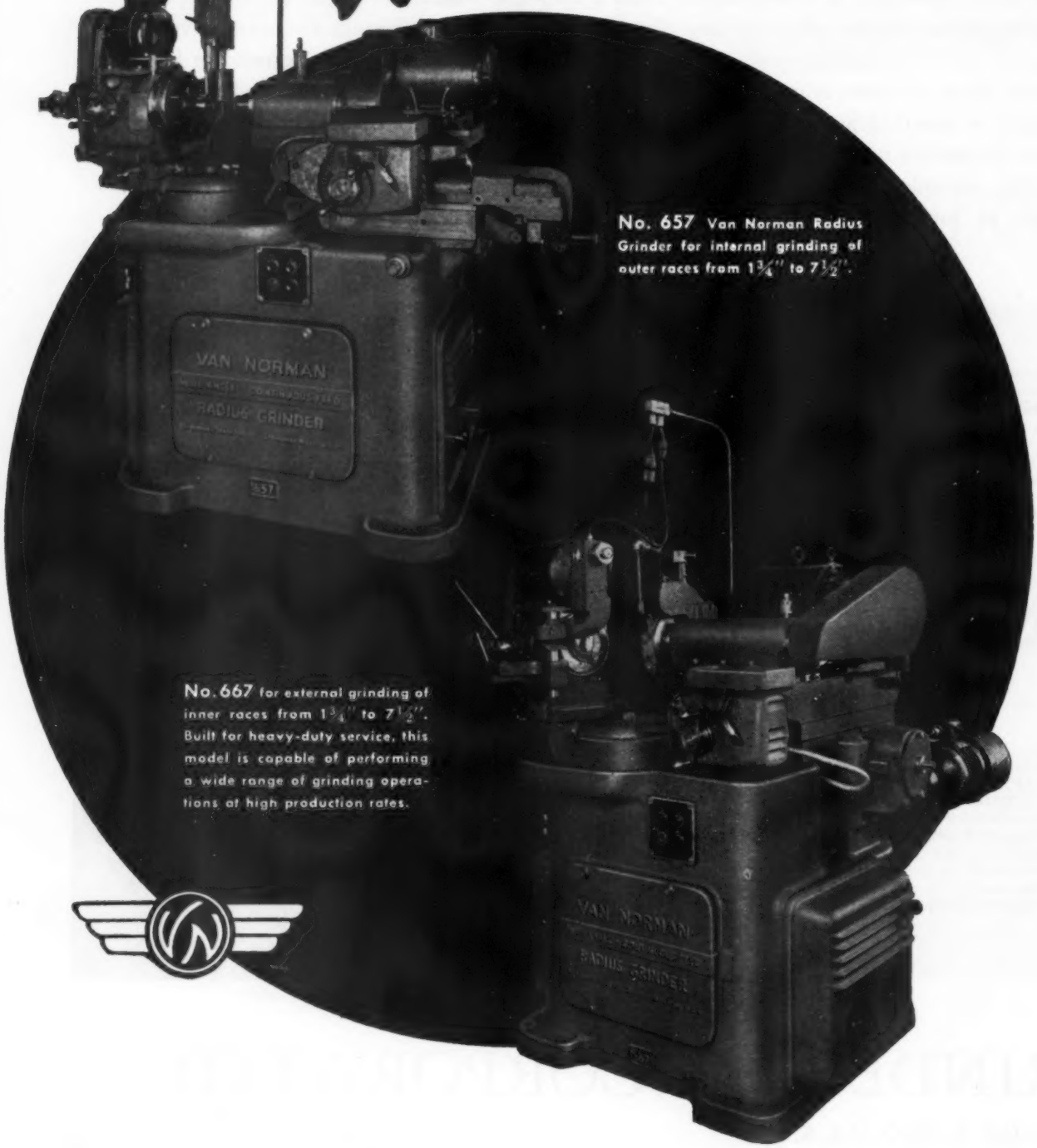
Right: Grinding outside diameter of 12" bearing races on a CINCINNATI No. 4 Centerless Grinder having increased capacity with special work rest. On this job the outside diameter of the races had to be exactly square with the previously ground faces.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Now... New and



No. 657 Van Norman Radius Grinder for internal grinding of outer races from 1¾" to 7½".

No. 667 for external grinding of inner races from 1¾" to 7½". Built for heavy-duty service, this model is capable of performing a wide range of grinding operations at high production rates.

Improved Radius Grinder

NEW VAN NORMAN

OSCILLATING RADIUS GRINDERS ASSURE EXTREME ACCURACY OF FINISHED PARTS... MINIMIZE REJECTS...REDUCE COSTS

Throughout the years, Van Norman has pioneered in oscillating radius grinder advancements and since 1914 Van Norman Radius Grinders have enjoyed world-wide acceptance as the "standard" for grinding ball races and other spherical surfaces.

Today, Van Norman engineering research scores again with new revolutionary designs and features that give the new Van Norman Grinders machine performance never before thought possible. Here are just a few of the new advancements that improve accuracy and quality of product, practically eliminate rejects and reduce maintenance . . . New continuous feed with adjustable roughing and finishing rates; New wide swing oscillation incorporating cable drive and Pittman type connecting rod for uniform oscillation throughout swing; improved electronic gauging; Universal control panel for wider range operation; Extra heavy-duty oscillating post, and extra large workhead and wheelhead for maximum rigidity; Improved automatic lubrication.

In addition Van Norman Radius Grinders have a built-in facility for grinding double-row races. And a special attachment is available for grinding magneto-type bearings.

The new improved Van Norman Oscillating Grinders are available in a wide range of types and sizes for ball race work and all types of industrial applications.

If you have a radius grinding problem, we suggest that you investigate Van Norman Grinders immediately. Our engineers will gladly help you with your particular problems and make their recommendations. Write for their services today.

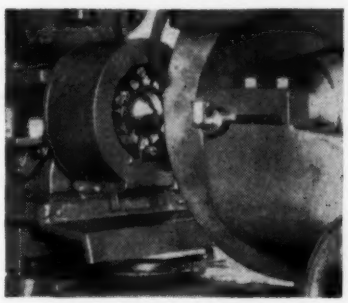
VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

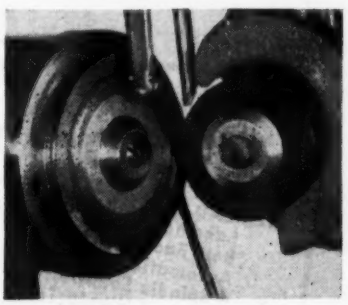
"It pays to Van Normanize"

Internal grinding of outer race.

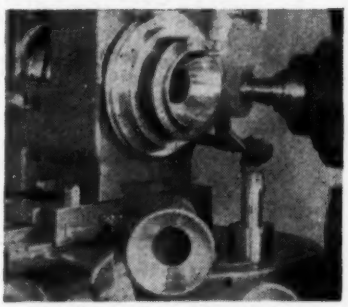
External grinding of inner race.



Grinding spherical Swivel cap.



Grinding a thrust bearing.



Grinding spherical bearing surface in automotive part.

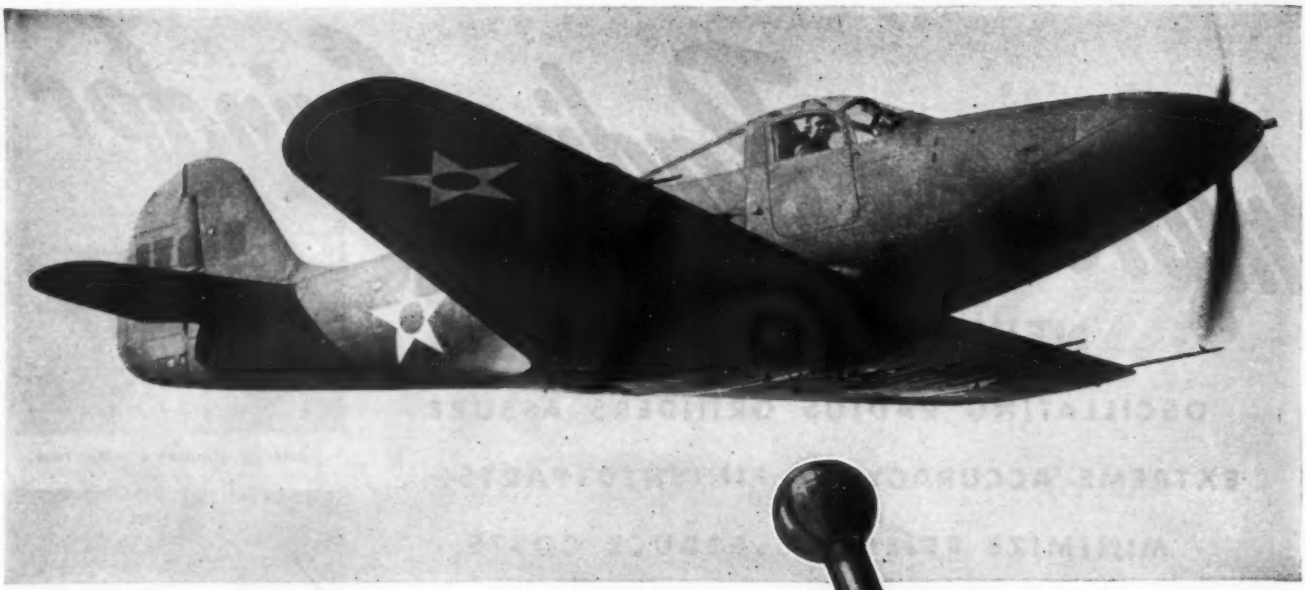
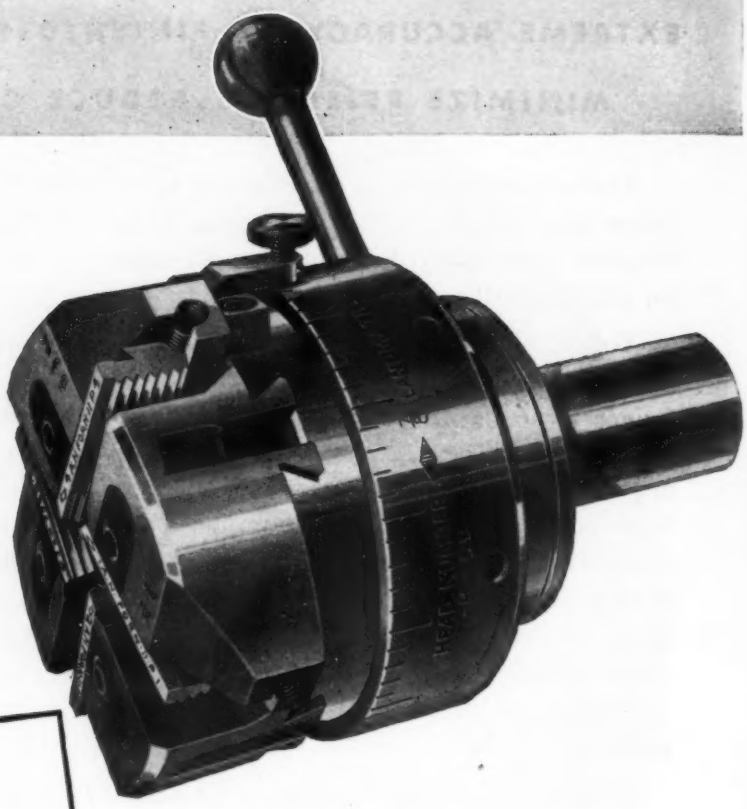


PHOTO BY COURTESY BELL AIRCRAFT CORP.

LANDIS
REG. U.S. TRADE—MARK PAT. OFF.



The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

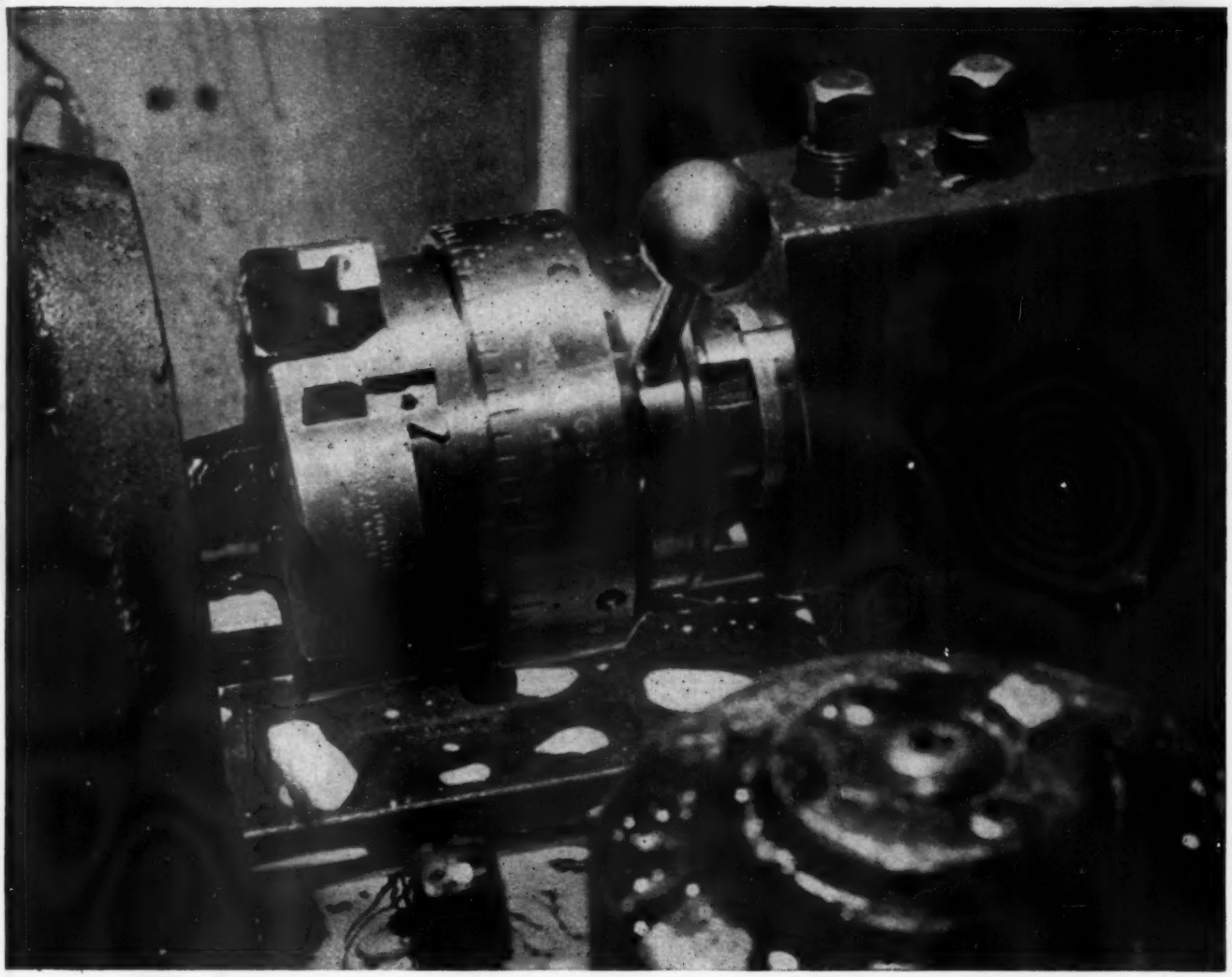
CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS

LANDMATIC TYPE H
HARDENED AND GROUND HEAD

has all parts made from special alloy steel —hardened and ground to assure maximum rigidity and accuracy.

Write for the Booklet
"BE THREADWISE"



FOR *finer* THREAD ACCURACY . . .
LANDMATIC HARDENED AND GROUND HEADS

The superior accuracy of Landmatic Hardened and Ground Heads is demonstrated daily in aircraft plants throughout the country. Whether it be retractable landing gear assemblies, bomb bay doors, engine parts, fuel lines—or hundreds of other vital components where threads are the prime fastening or functional means—LANDMATIC Heads are producing threads for these parts to the close tolerance specifications that assure dependable operation. LANDMATIC Heads will handle your threading operations equally as well.

Write for Bulletin No. F-80

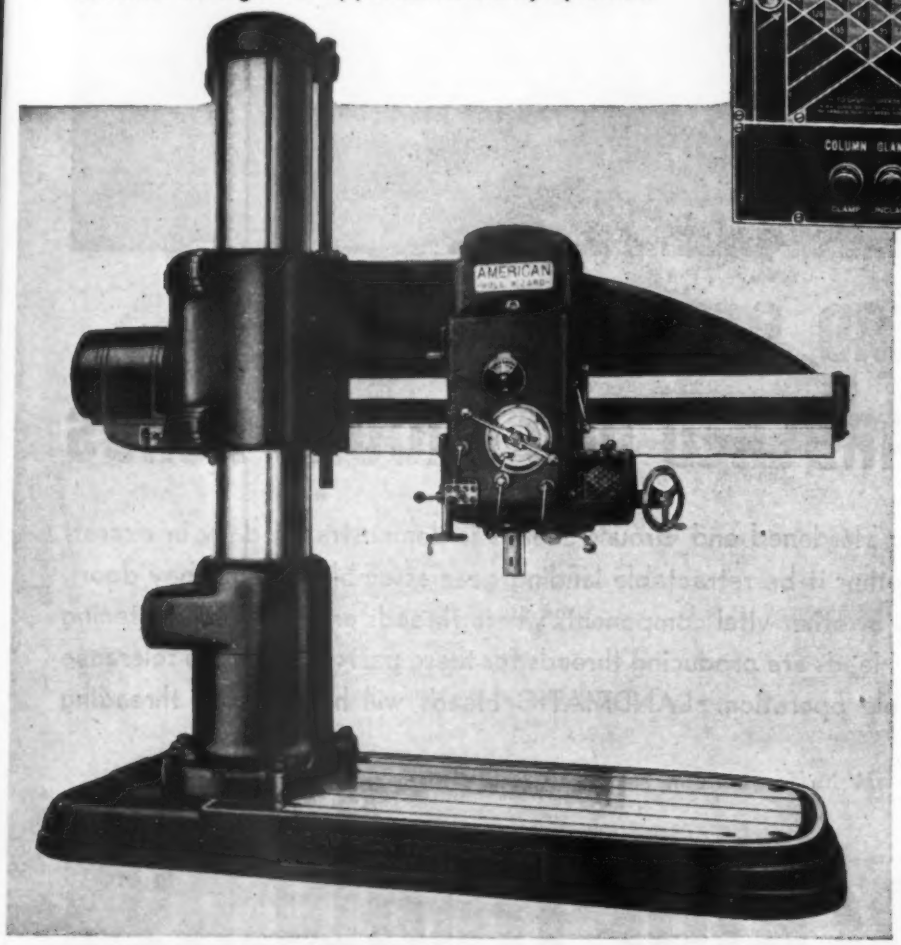
LANDIS MACHINE COMPANY
WAYNESBORO · PENNA · U·S·A·

32 SPINDLE SPEEDS

...with only 2 Control Levers and 1 Back Gear Lever

Operators are enthusiastic in their praise of this new direct reading speed control. They don't have to refer to index plates or retain lever positions in their minds when making speed changes. Its superiority and convenience encourages operators to use correct speeds for their work. Being direct reading, operators are not fearful of making mistakes.

The entire range of 32 spindle speeds is secured through two opposed vertically operated levers which are direct reading and one two-position back gear lever used only when changing from the high to the low speed range or vice versa.



This new speed control makes work easier; increases production because of it and the payroll dollar buys more as a consequence.

This and other fine features of the "American" Hole Wizard Radial Drill are thoroughly illustrated and described by Bulletin No. 326.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Every Belt a Specialist

In Allis-Chalmers' Great New V-Belt Line!

When Allis-Chalmers recommends a certain belt for a certain job, you can be sure it's the *right* belt. Because: 1) the Texrope line is *complete;* 2) Allis-Chalmers invented the multiple V-belt drive, offers engineering advice based on unparalleled experience. Both sound reasons for making Allis-Chalmers your "V-Belt Drive Headquarters."

1

HEAT-RESISTING SUPER-7, made of Buna-S synthetic rubber, has ability to withstand heat built right into it. Standard Super-7 belt, it can successfully operate in ambient temperatures up to 180 degrees F.

2

OIL-RESISTING SUPER-7 specializes in operating under fairly bad oil conditions. Neoprene, a synthetic impervious to oil, grease, other grimy liquids, is the cover for the regular Buna-S Texrope V-belt core.

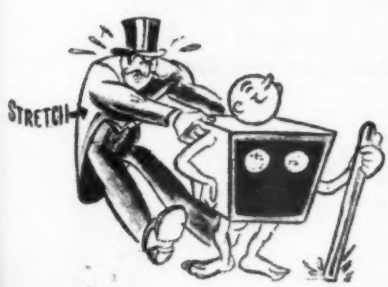
3

OIL-PROOF SUPER-7 is made of solid Neoprene, which is unaffected by most rubber-attacking liquids. It is recommended for drive installations where V-belts are virtually swimming in oil or grease.

4

STATIC-RESISTING SUPER-7 conducts static charge to machine to ground it. Static conducting element is contained throughout belt cover — can't wear off. This belt is used where explosion danger is present.

♪ *Tune in the Boston Symphony, Blue Network, every Sat. Eve.*



5

SUPER-7-STEEL employs endless cables of steel to reduce belt-stretch, provide greater horsepower. It is used where V-belt drive centers are hard to adjust, loads to be driven are extra heavy, space is limited.

A-1731

It pays to make

ALLIS-CHALMERS

your

V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

LEADS IN APPEARANCE

The clean, modern lines of the new Landis Tool Centerless Grinder are the result of the correct functional design. Operating parts are located exactly where they should be for best performance. The grinding wheel is located on the right of the operator for more convenient checking of the work. Driving motors mounted on self-contained wheel bases give greater rigidity and ease of adjustment. Enclosure of operating parts protects against damage. Hinged openings permit easy access to all operating parts for inspection or maintenance.

LANDIS TOOL *Precision Grinders*

LANDIS TOOL COMPANY

LEADS IN PERFORMANCE

LEADS IN APPEARANCE

LEADS IN PERFORMANCE

New, modern features make possible the superior finishes and high production that give the Landis Tool Centerless leadership in performance. These include: Faster stock removal to close limits and fine finish by rigid support of work in guide that extends up to center line of regulating wheel spindle • Simple rheostat controlled adjustable speed drive • Screw traverse adjustment of regulating wheel base for rapid, accurate wheel alignment • Tilting regulating wheel base for through feed grinding • Swiveling regulating wheel base for grinding tapers • Quick, easy setup of single work rest for parallel or tapered work • Single, convenient valve at operator position controls coolant for grinding and dressing.

Closeup of grinding wheel shows hydraulically controlled diamond dresser with earphone to determine when diamond is in contact with wheel.

LEADS IN DESIGN

New and advanced features have given LANDIS TOOL immediate leadership in centerless grinders. These include specific advances in the design of grinding wheel base, grinding wheel truing device, work rest, regulating wheel and hydraulic system, lubricating system, coolant system and electric controls. Some of the outstanding features are: Wheel dressed by hydraulic traverse of rigidly mounted diamond • Hydraulically controlled grinding wheel dresser accessible from operator position. Earphone to determine when diamond is in contact with wheel • Conveniently grouped main controls with master stop button for instantaneous control • Three position selector switch controls machine for "setup", "dress" and "grind" • Grinding wheel base adjustable to compensate for wheel wear and varying work diameter.

16

For complete information on the No. 12 Centerless Grinder, write for a copy of Catalog T44. Landis Tool Company, Waynesboro, Pa.

LANDIS TOOL Company

WAYNESBORO, PENNA.

It's a real "SMOOTHIE"

LATHE filing embodies a distinctive filing technique, and is employed to true-up a shaft, spindle, dowel pin, gear, hub or roll—to make it fit or rotate properly—to remove tool marks—in general, to produce a better finish on rounded surfaces. Often a lathe-turned part is purposely left a few thousandths of an inch "oversize" to permit a lathe-filing finish.

Lathe File vs. Mill File. Because of the 45° angle of its teeth, the Nicholson Long Angle Lathe File overcomes filling up and consequently scratching the surface of the work—a tendency common in the shorter-angle Mill Bastard when used as a "lathe" file. The chips slide down the gullets and are forced out at the edge by the motion of the work against the file. This not only makes the file self-clearing, but provides much cleaner shearing, eliminates drag or tear, prevents "chatter," and assures much faster cutting.

Much more can be said about this highly useful Nicholson special-purpose file—on proper use, and range of surface speeds for various metals and alloys. Full information is available in printed material we have on the subject—and which we will gladly mail, on request, to interested production and purchasing heads.

Consult your mill-supply house as to sizes, prices and deliveries.

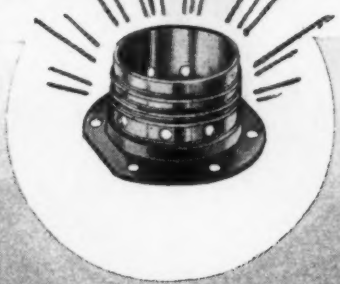
NICHOLSON FILE CO. • 29 ACORN STREET, PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

Note the long-angle teeth. Also, one edge of this file is "safe" (uncut) to protect shoulders of work and the "dog" of lathe.

NICHOLSON FILES *FOR EVERY PURPOSE*

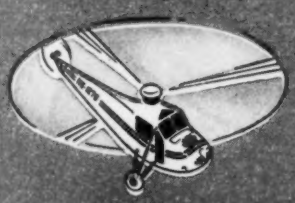
NICHOLSON U.S.A.

"It sounds to me like a job for Aeronautical Products, Inc."



WHAT KIND of precision parts does *your* post-war job require? Automatic screw machine . . . grinding . . . thread grinding . . . thread milling ...superfinishing...hyprolapping...heat treating...nitriding...plating...magnafluxing ...tolerances as low as .0001? The point is this: If your assemblies require the machining of parts to hair-breadth limits, we're equipped to do the job faster... better! In one organization with two great plants, ALL the facilities ANY job requires.

AND THAT'S NOT ALL! With a solid foundation built on the top-speed production of precision units for aircraft engines long before Pearl Harbor, plus 100% war output, it stands to reason we'll retain our leadership after the war is won! If *you* have a post-war problem, consult "Precision Pacesetters", with a *record of accomplishment!* Want ideas? Engineering help? Costs? Write our Executive Sales Offices for complete list of equipment and facilities.



● *THE SUCCESS of The Aeronautical Products, Inc. Helicopter, designed and built by our own craftsmen, promises new accomplishments in the post-war age of flight!*

AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT
and Administrative Offices:
18100 Ryan Road, Detroit 12

OHIO PLANT:
Washington Court House
Ohio

NORTON New Vitrified BONDED

Grind Faster
Last Longer
Cut Costs

NOW AVAILABLE
in the popular cup wheel sizes:

5″ diameter
6″ diameter
7″ diameter

NORTON ABRASIVES

Diamond Wheels

...for Carbide Tool Grinding

NOW you can get the Norton Vitrified Bonded Diamond Wheel in cup sizes for all the popular makes of carbide tool grinders. You can have the same combination of fast cutting action and extremely long life that has made Norton Vitrified Diamond Chip Breaker Wheels and Hand Hones so outstandingly popular.

These vitrified bonded diamond products are a patented development of Norton research. In widespread field trials their performance has been truly sensational.

IN STOCK

Size: 6 x 3/4 x 1 1/4" (3/4" rim), ME 27853, Type D6WHC
Specifications: D120-N100V 1/16 and D150-P100V 1/16
(also all the popular sizes of chip breaker wheels and hand hones)

Other cup sizes and specifications of Norton Vitrified Diamond Wheels can be supplied promptly. Consult your Norton abrasive engineer or distributor.

NORTON COMPANY, Worcester 6, Mass.

Distributors in All Principal Cities

W-996

Performance Data

NORTON VITRIFIED DIAMOND CUP WHEELS

Aircraft Motor Plant

Seventeen days' life for Norton vitrified diamond cup wheel —four days' life from resinoid diamond wheels of same specifications.

Machine Tool Builder

Norton vitrified diamond wheel cut faster than metal bonded, lasted much longer than resinoid diamond wheel. Finish so satisfactory that one wheel will substitute for separate roughing and finishing operations.

Tractor Plant

Norton 320 grit vitrified diamond wheel lasted 800 hours as against only 120 hours for 240 grit resinoid diamond wheels.

Aircraft Parts Plant

Norton vitrified diamond cup wheel required much less grinding pressure, cut cooler and gave better finish than metal bonded wheel.

Steel Tube Plant

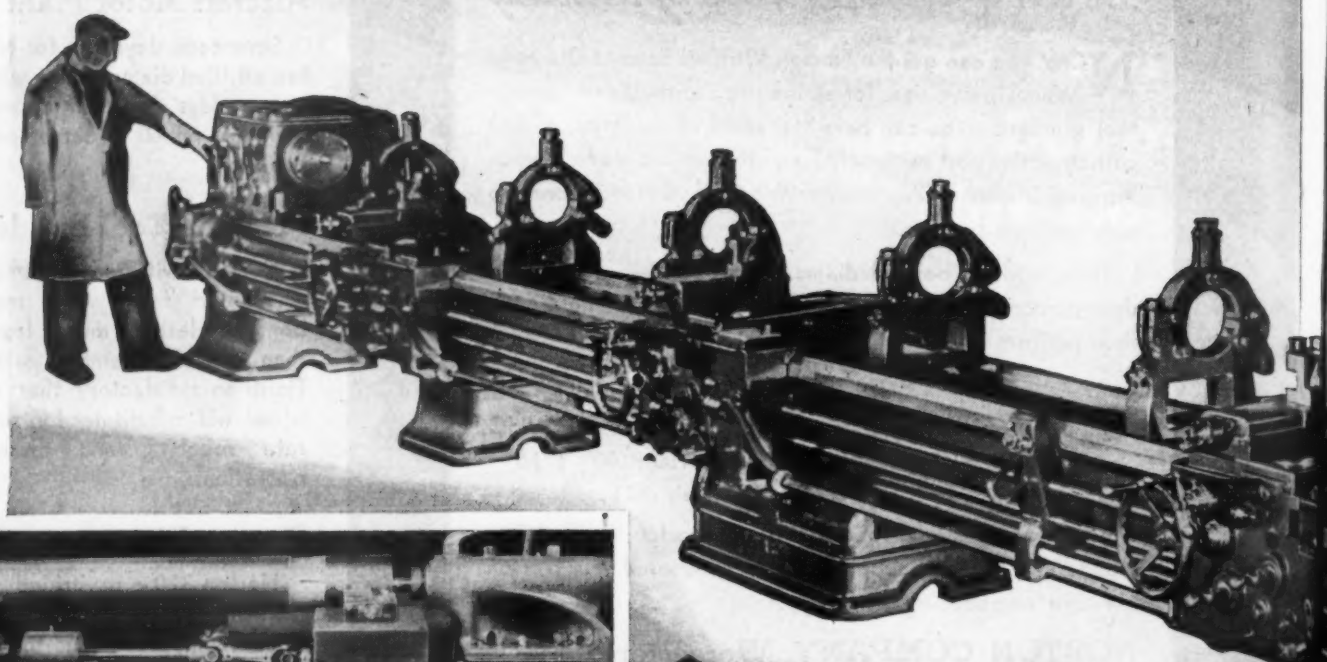
Norton vitrified diamond wheel lasted 96 days as against seven days' life from resinoid diamond wheels.

Carbide Tool Maker

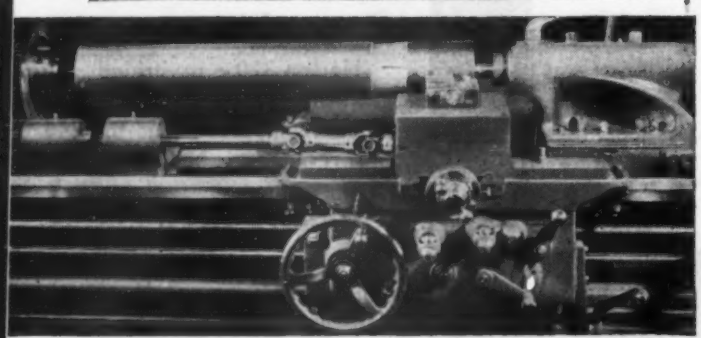
Norton 120 grit vitrified diamond wheel reported fastest cutting wheel ever tried. Not worn out after two weeks' use; regular diamond wheels lasted eight to nine days.

NORTON ABRASIVES

To reduce your turning



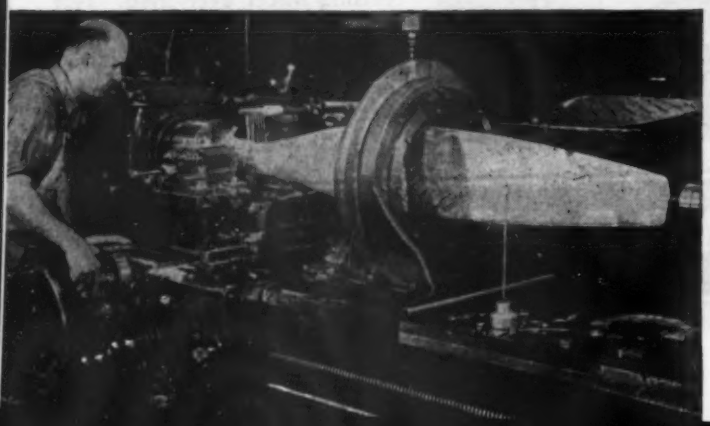
By using three carriages, operating simultaneously, two-thirds reduction in the machining time of periscope tubes was effected by this Monarch machine. The 40′ bed is made in two sections, joined together as accurately as if made in one piece. Steady rests shown are standard Monarch units.

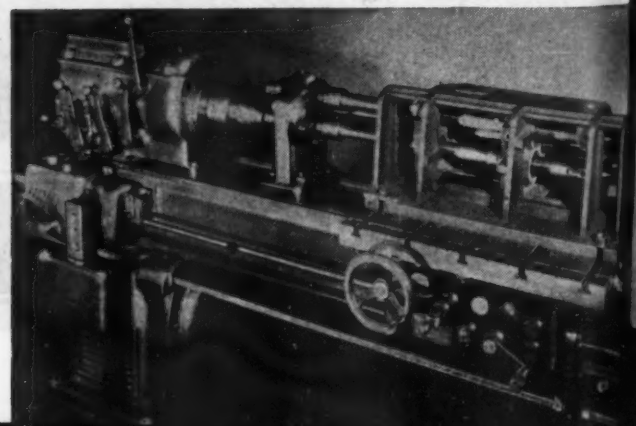


A special contour shape turning device on this standard Monarch lathe was developed to speed delivery of landing gear struts. A large number of these special Monarchs are used in all plants producing this work.

Machining the hub end of this propeller blade requires 13 tools, but is done in one setup on this Monarch lathe. One large propeller plant uses several of these lathes for this purpose.

One operator can handle several of these Monarch lathes, used in our own plant as horizontal boring machines. They are equipped with special type platen carriages, on which the work-holding boring fixtures are mounted. These machines reduce production costs and assure accurate duplication.





costs... SEE MONARCH

Illustrated here are a few of the many ingenious time-saving applications of standard or special Monarch lathes for war production. Postwar, machines such as these will more than pay their way by delivering increased output of high quality turning, boring or facing work. Especially, they will help offset higher man power costs. If you would like a demonstration of how Monarch turning machines can be profitably applied to your work, our engineers are at your service.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

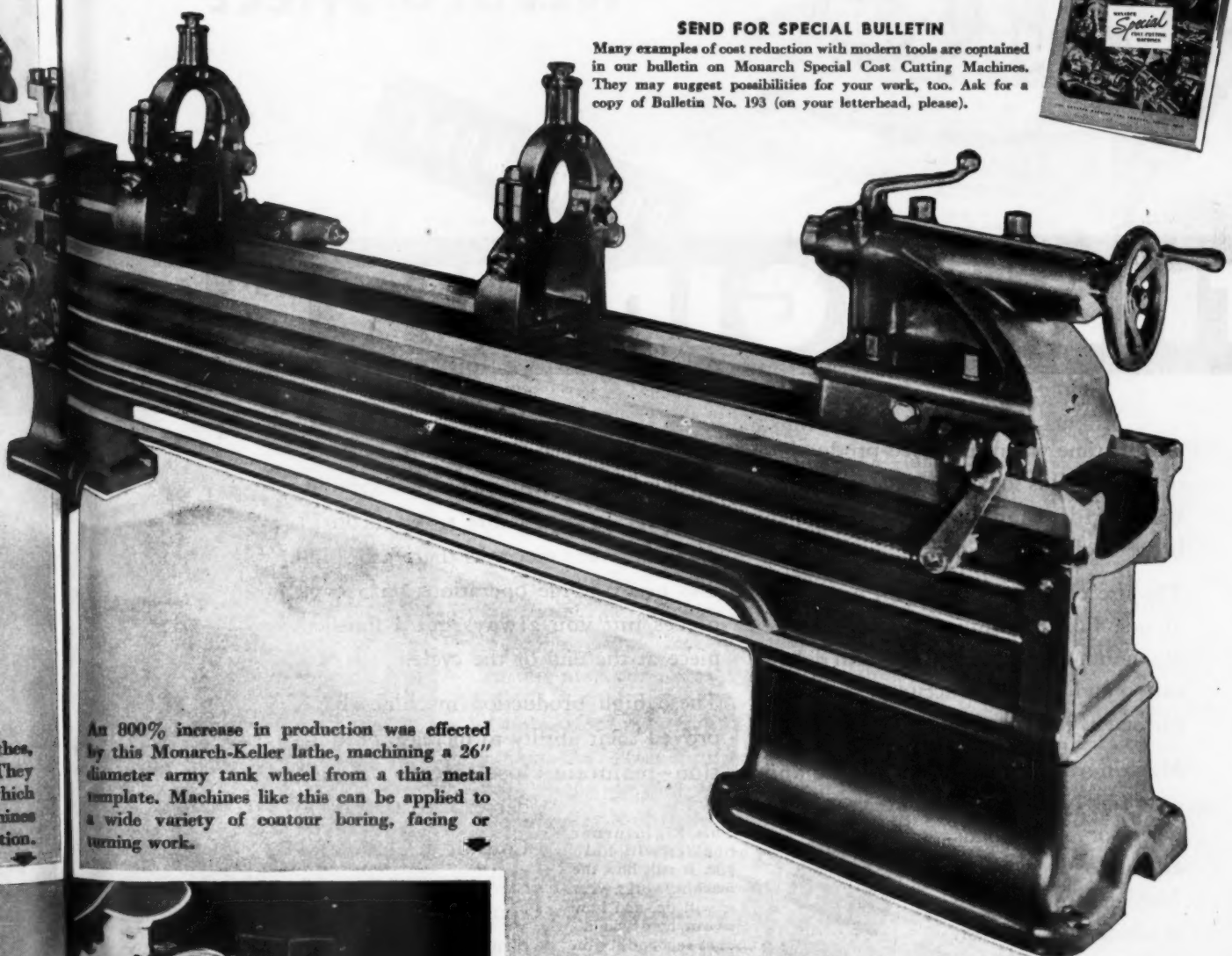
DIRECT FACTORY BRANCHES:

801 Fisher Bldg., Detroit 2, Mich.
622 W. Washington Blvd., Chicago 6, Ill.
1060 Broad Street, Newark 2, N. J.
512 Empire Bldg., Pittsburgh 22, Pa.
10465 Carnegie Ave., Cleveland 6, Ohio

Representatives in principal cities

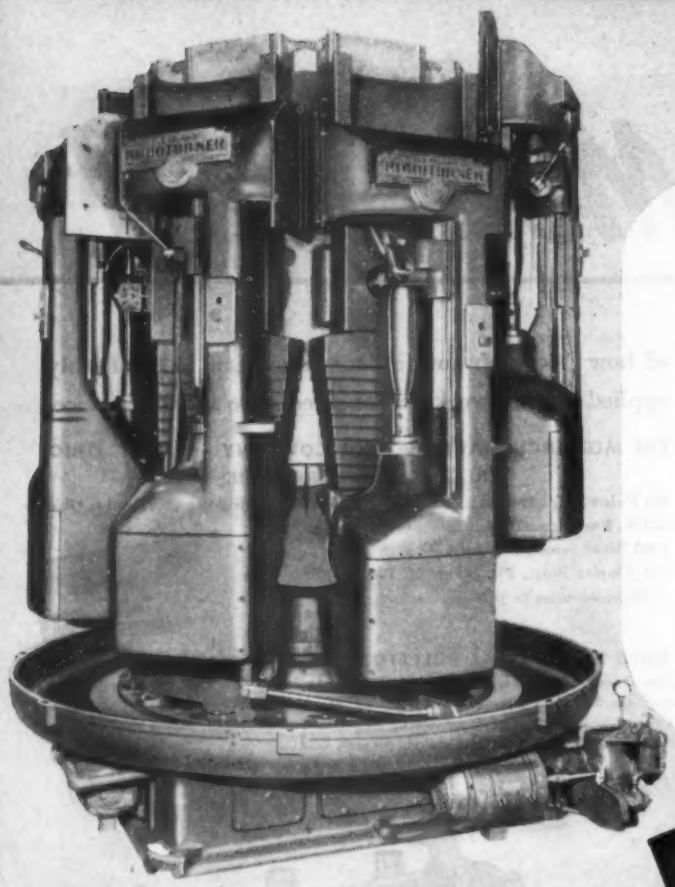
SEND FOR SPECIAL BULLETIN

Many examples of cost reduction with modern tools are contained in our bulletin on Monarch Special Cost Cutting Machines. They may suggest possibilities for your work, too. Ask for a copy of Bulletin No. 193 (on your letterhead, please).



An 800% increase in production was effected by this Monarch-Keller lathe, machining a 26" diameter army tank wheel from a thin metal template. Machines like this can be applied to a wide variety of contour boring, facing or turning work.

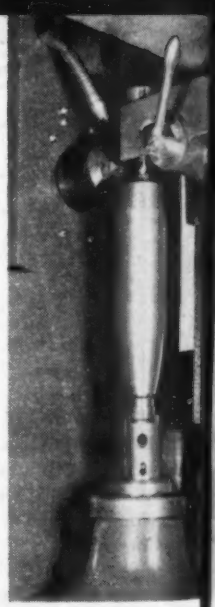
Monarch Saves Time



HERE'S HOW TO INCREASE PRODUCTION OF VITALLY NEEDED SHELL

ROTARY MODEL

THE RIGIDTURNER



At this time when increased production of vital shell is so badly needed you will find Rigidturners are doing much to boost shell production.

The use of eight spindles all operating at one time, continuously, insures the maximum of production. Faithful duplication and continued accuracy is accomplished by the use of special form cutters.

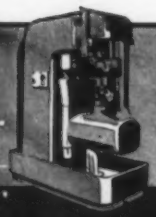
Machine operation is automatic and extremely simple. Operator merely loads and unloads work at loading position—the machine does the rest.

A finished shell comes off at each cycle. On this job the same piece is being machined on each spindle, however it is possible to work on as many different pieces as there are spindles or to divide operations on 3 or 4 pieces but you always get a finished piece at the end of the cycle.

These high production machines have proved their ability to increase production—maintain close tolerances—and decrease costs.

Consult a Cleveland Hobbing Engineer on your shell or multiple diameter turning work. No obligation.

This Rigidturner booklet will help you. It tells how the machine works, what it will do, and how it can help you increase production and cut costs. Write for your copy today



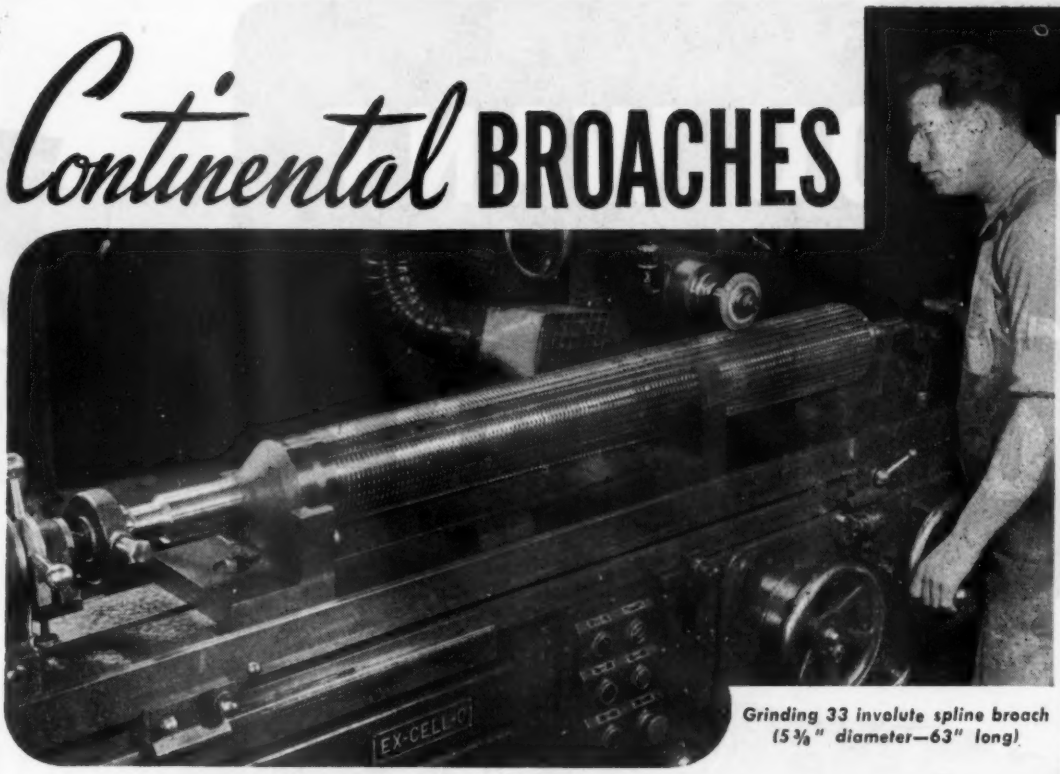
The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

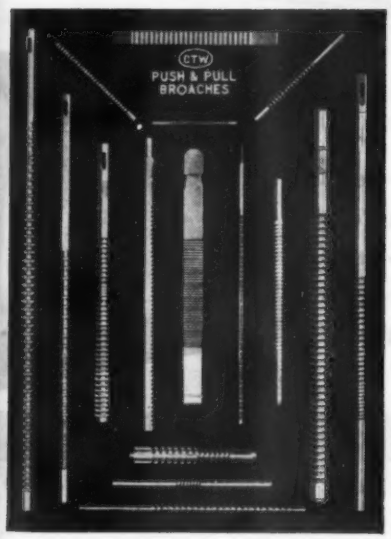
Continental BROACHES



Grinding 33 involute spline broach (5 3/8" diameter—63" long)

...a complete range of internal and external *(surface)* Broaches...Fixtures... Holders...Pullers—to CONTINENTAL PRECISION STANDARDS

CONTINENTAL TOOL WORKS — CTW — EX-CELL-O CORPORATION



Continental broaches are available for a wide variety of operations

In *your* planning . . . for today and tomorrow . . . keep in mind that broaching may give you unusual opportunities for increasing production, reducing unit cost, holding closer tolerances, and improving finish.

Continental Tool Works is a pioneer in the field of broaching, a process now widely used throughout the metal-working industry as one of the fastest methods to remove stock to precision limits.

Continental broaches are ground by skilled broach-makers to exceedingly close tolerances. Extreme care in design and workmanship insures that each Continental broach is exactly fitted for the job it is intended to do. These are reasons why Continental-made broaches produce more parts per grind, more grinds per broach. *Write to Continental today.*

CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

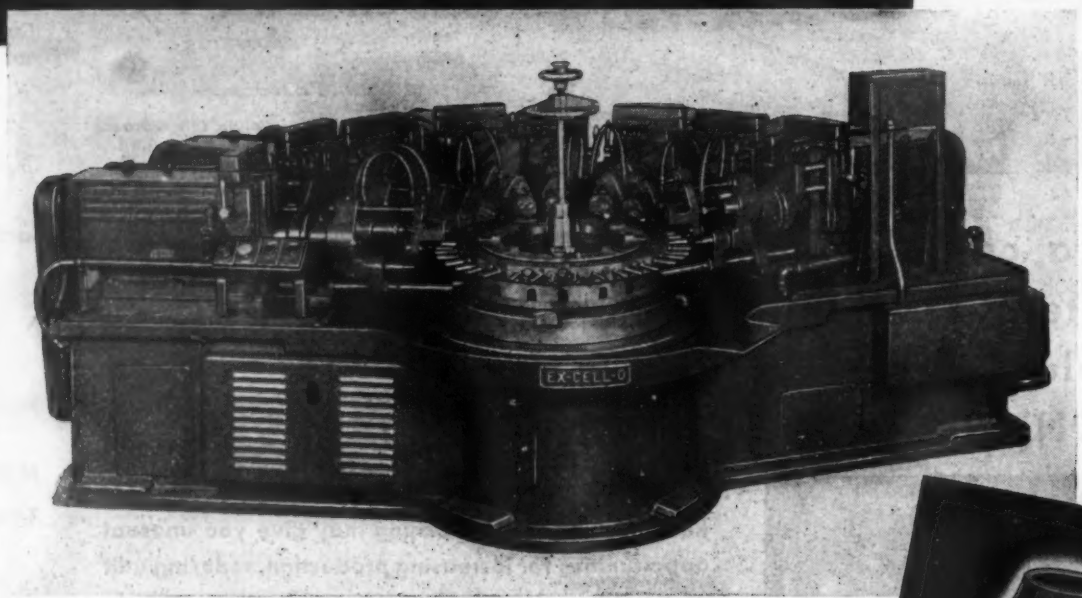
DETROIT 6 MICHIGAN

***Continental* CUTTING TOOLS**

- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45-35

DO YOU WANT *Low-cost* PRODUCTION?

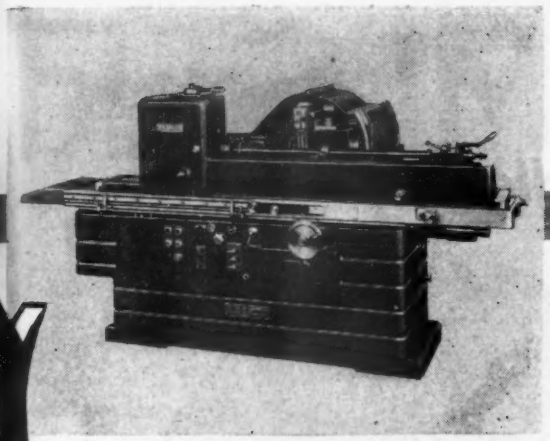


Ex-Cell-O horizontal Special Machine equipped with 9 Ex-Cell-O Hydraulic Power Units for drilling and reaming 36 holes in aircraft parts . . . one of many machines designed and built by Ex-Cell-O for specific requirements; often performing numerous operations in one setting and assuring large savings in production costs.

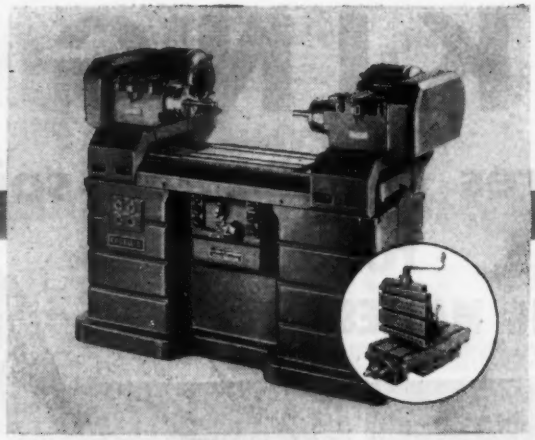
XLO

EX-CELL-O *for* PRECISION

EX-CELL-O makes Standard and Special Multiple Way-Type Precision Boring Machines • Multiple Drilling and other Special Purpose Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Broaches and Broach Sharpening



PRECISION THREAD GRINDERS—For higher production, greater accuracy, and more economy in producing threaded work, Ex-Cell-O precision thread grinders are now universally used by modern industry. Nine standard styles—for external and internal threads—are available for today's needs.



PRECISION BORING MACHINES—Nine standard styles for boring, turning, and facing to extremely close uniform limits with high finish. Hydraulically or manually operated fixtures designed for each job. Similar precision in design and operation is also found in the Ex-Cell-O Universal Fixture (see insert).

EX-CELL-O Standard and Special Machine Tools Provide Utmost Economy with Required Accuracy

Ex-Cell-O is a pioneer in the development of precision machine tools — for boring, turning, facing, thread grinding, tool grinding, and lapping. The sound design and rigidity of their construction, the simplicity of their operation, the substantial production they attain on an economical basis, make these Ex-Cell-O machines of practical interest both to the manufacturers who order their installation and to the men and women who operate the machines.

EX-CELL-O CORPORATION
DETROIT 6

If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

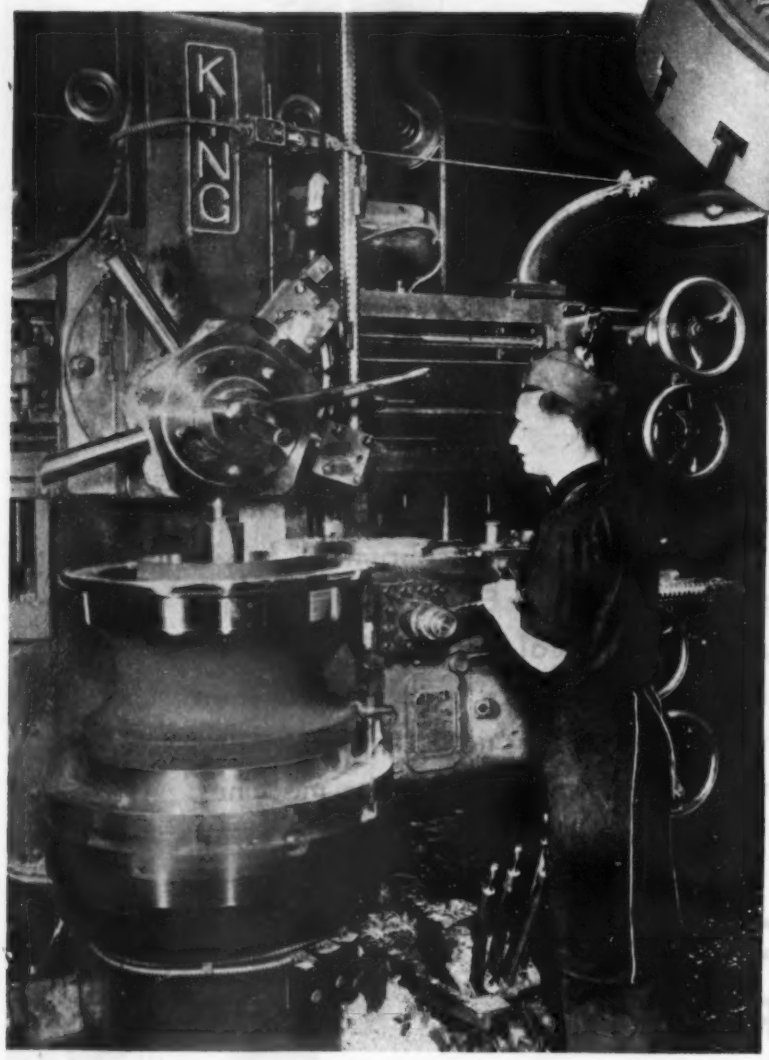
45-34

Machines • Hydraulic Power Units • Grinding Spindles • Drill Jig Bushings • Continental Cutting Tools • Tool Grinders • Fuel Injection Equipment • R. R. Pins and Bushings Pure-Pak Paper Milk Bottle Machines • Aircraft and Miscellaneous Production Parts

KING

features high speed spindle for

TURNING MAGNESIUM WHEELS



● Illustrating one of a battery of King 36" Vertical Boring and Turning Machines boring the inner hub and turning brake drums on aircraft landing wheels.

These machines are set up for high production. Operation is simple. The wheels are made of a magnesium and are turned at high speed. Note the high speed spindle used on this battery of King machines illustrated in the insert.

Another feature which facilitates operation and insures exact duplication is the full electric control to turret and side head. This mechanism provides full automatic stops for turret and side head—operator merely throws in the feed and tools stop automatically when cut has reached required depth.

For greater production—closer tolerances—lower costs—investigate the many advantages of King Vertical Boring and Turning Machines.

KING BUILDS Vertical Boring & Turning mills in single column types from 30" to 42"—double column types up to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

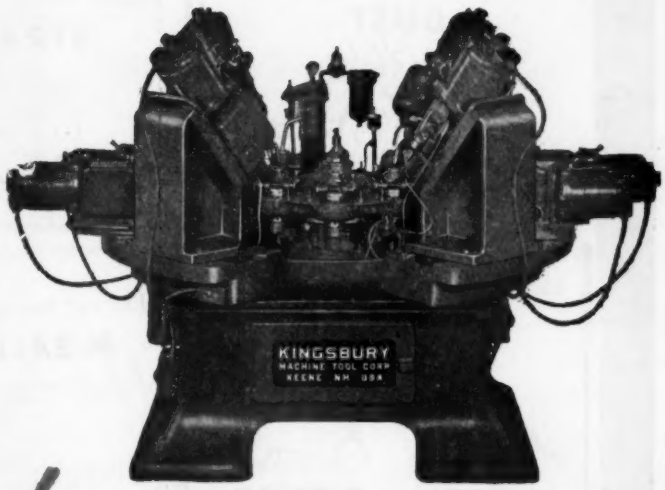
FLEXIMATIC

Demonstrates its Speed and Accuracy on Fuse Part Production

Drilling, counterboring and tapping brass fuse part components—doing the entire job in a single chucking of the work—producing 500 completed parts per hour! Jobs like this, that demonstarte FLEXIMATIC speed, simplicity and accuracy, are the reason why FLEXIMATICS are so widely chosen for intricate operations on munitions parts.

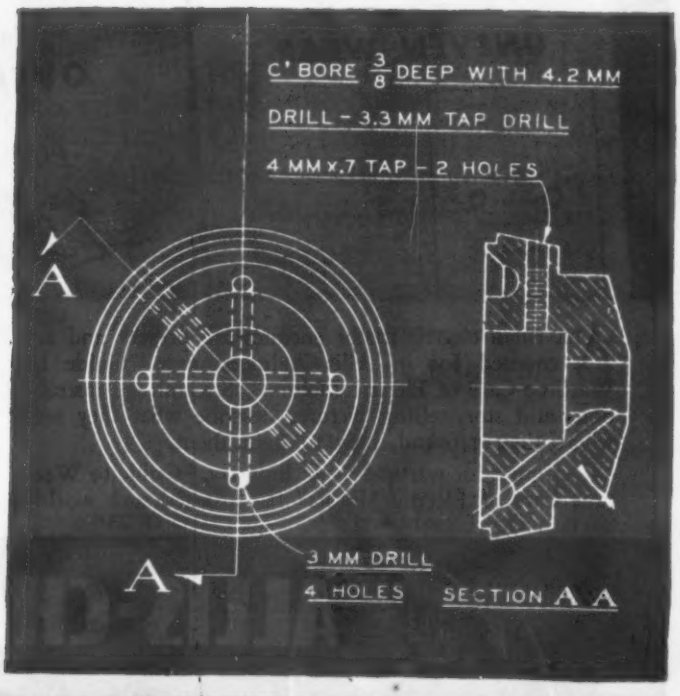
Kingsbury FLEXIMATICS are made up of standard units mounted on one of several types of standard bases. This method greatly lowers the cost of special machine construction and, in addition, permits changes to be readily made to meet changes in production. In the FLEXIMATIC illustrated, individual work holding fixtures in the turret are automatically indexed during the indexing of the main turret, thus presenting the part in various positions at the work stations so that all the operations are performed in a single chucking.

To meet the exacting standards of accuracy and the imperative need for speed in munitions production, choose FLEXIMATICS by Kingsbury!



by KINGSBURY

THIS IS A FLEXIMATIC MUNITIONS JOB!



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

1 Pill for 9 Headaches!

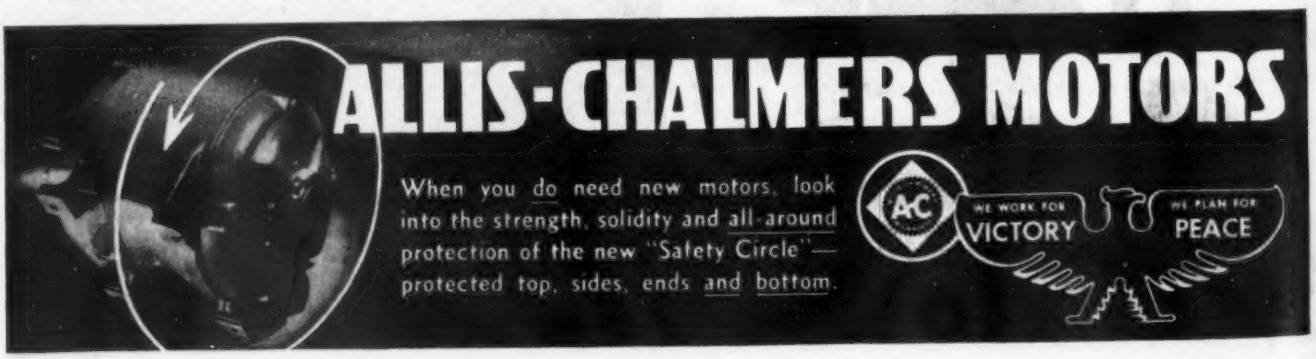
PAGES FROM "A GUIDE TO WARTIME CARE OF ELECTRIC MOTORS"

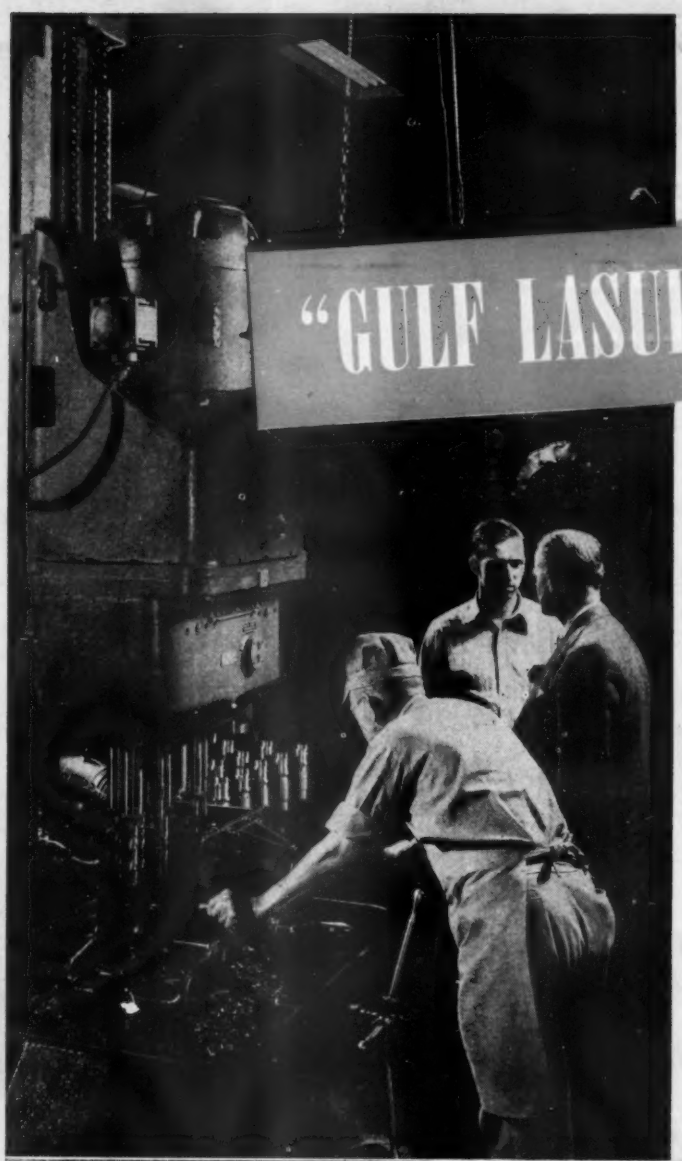
Electric Motor Enemy No. 1 . .
DUST
DUST ON IT'S WINDINGS "BLANKETS" A MOTOR WITH A LAYER OF INSULATION.
Electric Motor Enemy No. 2 . .
STRAY OIL
OIL IS QUICK TO ATTACK INSULATION WHEN IT REACHES IT.
Electric Motor Enemy No. 3 . . .
MOISTURE
HEAVEN for a motor room certainly would be a dry place. And while it is impractical to keep motors completely dry in many installations, that nevertheless should be one general aim of effective
How to Fight it . . .
Every effort should be made to keep water in liquid form from dripping
Electric Motor Enemy No. 4 . . .
FRICTION
IN THEORY, no wear can take
Electric Motor Enemy No. 5 . . .
MISALIGNMENT
ONCE MISALIGNMENT SORTS 'EM FIGHTING EACH OTHER . . .
Electric Motor Enemy No. 6 . . .
VIBRATION
VIBRATION SHAKES THE LIFE OUT OF MOTORS
Electric Motor Enemy No. 7 . . .
UNEVEN WEAR
YOU EXPECT WEAR AT SOME POINTS . . .
(TIRES ON A CAR)
ON SLIP rings and commutators
Electric Motor Enemy No. 8 . . .
OVERLOAD
LIKE AN OVERLOADED HORSE, A MOTOR WORKED BEYOND IT'S HORSEPOWER CAPACITY IS SURE TO BREAK DOWN.
Electric Motor Enemy No. 9 . . .
UNDERLOAD
ALTHOUGH the peaks are less severe, underloading an induction motor is just as clearly improper as overloading it.
of wattless current is INCREASED.
Technically the "power factor" (ratio of real power to total power) is lowered.
Comparing total or apparent power to a unit of a given size, we see that wattless current is like fat; real power, like muscle. The more of one, the less of the other.
And because there is a limit to the power capacity of generators, transformers and power lines, the character or quality of the total power is of prime importance.

ALL NINE electric motor enemies are present and accounted for in Allis-Chalmers' new "Guide to Wartime Care of Electric Motors." Streamlined instructions and story-telling pictures describe what they are, where they're found, how to fight them.

Designed for wartime U. S. industry, "Guide to Wartime Care of Electric Motors" has aroused such world-wide demand that Spanish and Portuguese editions are now printing!

You'll find this valuable new handbook ideal both for training new men and "brushing up" old hands. It contains no advertising. Write today for *your* free copy of this tremendously successful handbook to ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN. A 1625


ALLIS-CHALMERS MOTORS
When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom.
AC
WE WORK FOR VICTORY
WE PLAN FOR PEACE



"GULF LASUPAR CUTTING OIL

helped us increase production 15%

_____tool life over 100%"

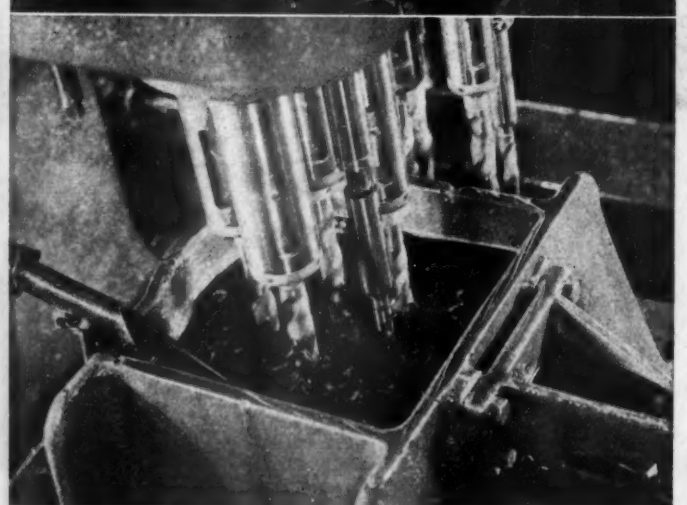
says this aircraft motor plant Foreman

WE GET BETTER RESULTS with Gulf Lasupar Cutting Oil than with any other cutting fluid we have tried for drilling master connecting rods," says this Foreman. "Lasupar helped us step up production 15% and tool life over 100%."

Here is a cutting oil that may be the answer to your tough, hard-to-speed-up machining operations—and to your requirements for an exceptionally fine finish on the work. Gulf Lasupar Cutting Oil has set new standards of performance for tough jobs in hundreds of aircraft, armament, and munitions plants.

And war production reports on Gulf Lasupar have a peacetime value: This performance-proven cutting oil can give important help to shops seeking lower unit production costs for postwar business!

Gulf Lasupar Cutting Oil—and the other quality cutting oils in Gulf's complete line—are available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office today.



(Above) Actual photo of a Gulf Service Engineer (right) consulting with Foreman on results with Gulf Lasupar Cutting Oil in drilling master connecting rods for aircraft engines. *(Below)* Close-up of drilling operation.

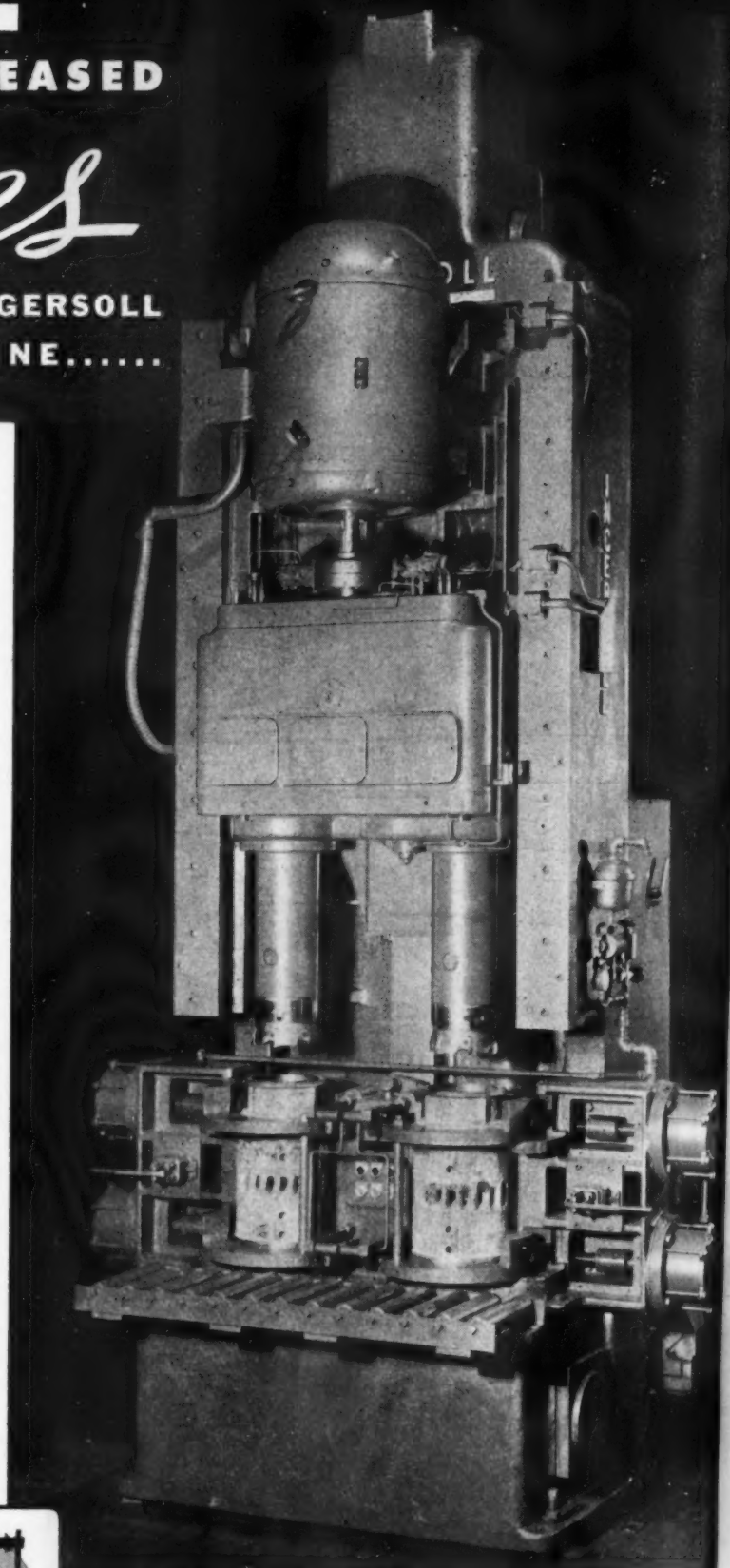
GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH 30, PA.

PRODUCTION INCREASED

3 times

WITH THIS 2 SPINDLE INGERSOLL SLEEVE BORING MACHINE.....



- Rough Bores Diesel Engine Cylinder Sleeves at the rate of 26 pieces per hour . . . more than 3 times the rate of the old machines it replaced.

- Air operated fixtures and push button control make the operation of the machine faster and Ingersoll patented precision spindles increase accuracy obtained at faster production rates.

- This boring machine is a specialized answer to a particular problem. Although your production problems may be entirely different, a study of them will determine whether similar results can be obtained with special machinery. May we help?

THE INGERSOLL MILLING MACHINE CO.
ROCKFORD, ILLINOIS

INGERSOLL

SPECIALIZED MILLING, DRILLING, BORING, TAPPING, SCALPING MACHINES

THE CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Helicopters capable of lifting as much as 15 tons and of carrying 35 or 40 persons, plus mail and baggage, are believed by one expert to be within the realm of possibility. *Col. H. F. Gregory, Engineering Division, Materiel Command, U.S.A.*

get ready with CONE for tomorrow

A pilot flying between South America and Africa recently flew across the Atlantic four times in three days. *Office of War Information.*

get ready with CONE for tomorrow

One of the country's leading department stores has scheduled a Postwar Fair for next May. Manufacturers are invited to participate, but space is not for sale. *R. H. Macy, New York City.*

get ready with CONE for tomorrow

Salvage apparatus for extremely great ocean depths has been patented. Its powerful jaws are guided by television apparatus. *Patent 2,355,086.*

get ready with CONE for tomorrow

Because of the high cost of converting ordinary electric power into high-frequency power, it is not at present believed that electronic cooking is practical for household use, although in commercial food processing it has great possibilities. Typical of its application to food processing is the recent experiment with packaged pancake flour in which the temperature inside the package was raised to 130 degrees in less than 30 seconds, completely destroying all insect life. *Scientific American.*

get ready with CONE for tomorrow

Rubber scientists think that they have solved the problem of ice on airplane propellors by the use of a three-ply rubber covering, the center layer of which is an electric heating element. *Goodyear Tire & Rubber Co.*

get ready with CONE for tomorrow

An inter-continental highway between Alaska and Siberia, by way of a tunnel under Bering Strait, is being seriously considered. *Alaska Highway Committee of Pacific Northwest Trade Association.*

Experiments are being made with plastic bottles blown in the same molds used for glass. *Advertising & Selling.*

get ready with CONE for tomorrow

A total of 29 dams is planned for the Pacific Northwest, the first six of which will cost 226 million dollars and provide power and water for a population of 2 million. *Engineering & Mining Journal.*

get ready with CONE for tomorrow

A new method of dyeing acetate rayon is said to make the colors practically fade-proof. *North Carolina Fabrics Corporation.*

get ready with CONE for tomorrow

A large airplane manufacturer has produced an experimental model of a 200 pound automobile. *Science Digest.*

The first commercial model of a sound-on-tape machine has been made and is said to play continuously for eight hours. *Fonda Corporation.*

get ready with CONE for tomorrow

The use of music in factories is expected to create jobs for 26,000 musically trained broadcast directors. *Science News Letter.*

get ready with CONE for tomorrow

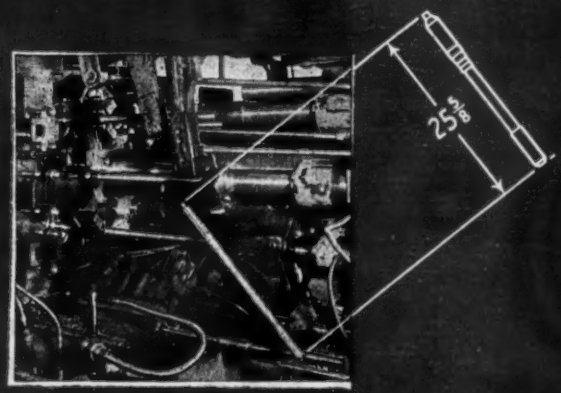
A new device that opens and closes a window thermostatically is waiting for release of materials to go into production. *E. O. Gillen, 1713 N. Water St., Milwaukee.*

get ready with CONE for tomorrow

A new eight-engined flying freight boat with 320 foot wing span is expected to be ready about the first of the year. *Howard Hughes, Aviation News.*

get ready with CONE for tomorrow

A new ingredient added to the Army's soap is said to make it work effectively in any sort of water, salt, fresh, cold, hot, soft, or hard. *E. I. duPont de Nemours & Co. Inc.*



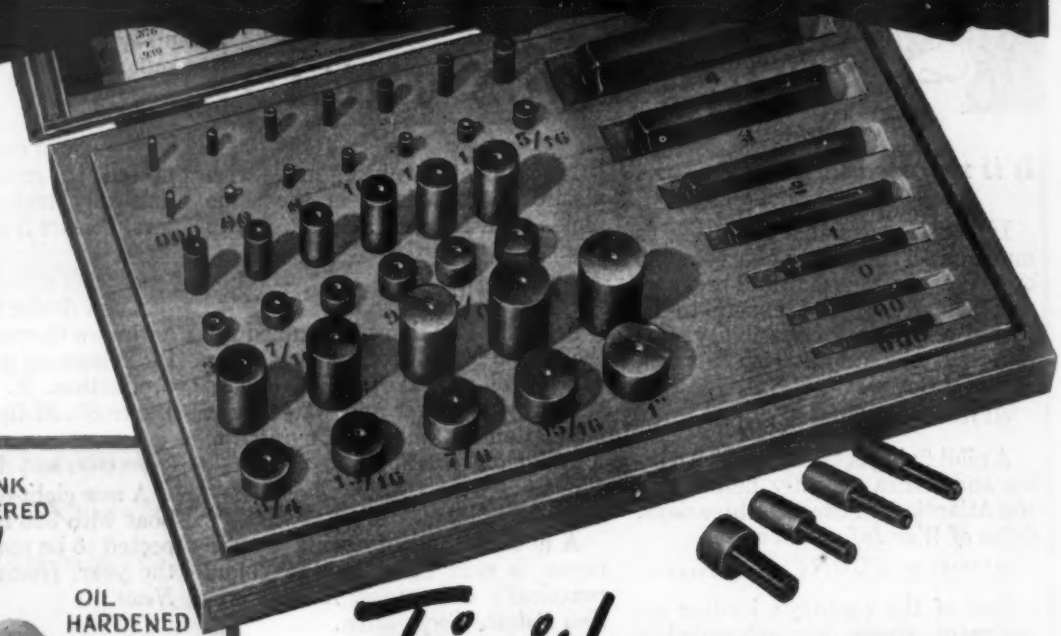
...and remarkable things are being done NOW

Turning a shaft of this length was considered impractical for a multiple spindle automatic lathe — until it was produced on an 8-spindle Conomatic in the unusually fast time of 63 seconds. Such speed, plus high precision, has given us the best equipped armies in the world and will, when the war is won, make our manufacturers the most productive in the world.

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

Don't wait for special plug gages!



Finish your own—

FROM THIS SET OF

SCHERR PLUG GAGE BLANKS

Here is a new idea, which has been received with enthusiasm wherever offered. It eliminates delay in starting production on a hole job, while waiting for delivery of the necessary plug gages.

Any shop with a good toolroom or cylindrical grinder can finish these blanks to specified size. The set includes blanks for finished sizes from .029" to 1.010". The blanks are complete and finished in every respect except for final grinding. Both centers are lapped for accurate centering, and all that is needed is a few minutes between centers on a cylindrical grinder, with lapping in addition if finer than commercial finish is required. There are 36 blanks in the set and 7 hexagon handles.

Price for the complete set, $49.50. Individual gage blanks available from .059" to 1.510". Write for details and quotation.

THE EASY WAY TO CHECK PLUG GAGES —a Scherr Comparitol and a set of Scherr Ultra-Chex — the gage blocks that give 80,000 combinations in steps of 1/10,000"

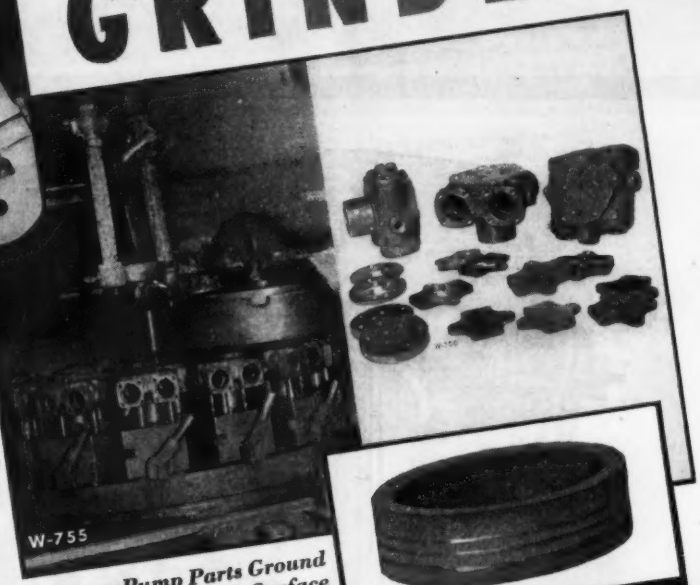
GAGEMAKERS — BIG SAVINGS FOR YOU! *In making up gages to your customer's orders, why not buy the blanks from us? You save time, trouble, money. Ask us for quantity quotation.*

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

Use Blanchard Wheels on BLANCHARD GRINDERS

Blanchard SECTORED Wheel

Bronze Turbo Pump Casings Ground on No. 18 Blanchard Surface Grinder.



Oil Burner Pump Parts Ground on No. 18 Blanchard Surface Grinder.

BLANCHARD CYLINDER WHEEL

Blanchard SEGMENT Wheel

Cast Iron Saw Tables Ground on No. 18 Blanchard Surface Grinder.

In manufacturing wheels for Blanchard Surface Grinders, Blanchard, as builders of the grinders, are able to bring their accumulated knowledge and experience to bear on the proper selection of the correct wheel for every job to be ground.

For example the bronze turbo pump parts shown here were ground with a free cutting wheel, a Blanchard 30C40 Sectored Wheel, and this work was ground flat to .0002".

The oil burner parts, also shown, were ground on a No. 18 Blanchard Surface Grinder. They were rough ground by using Blanchard Wheel 30C40. For finishing after normalizing, Blanchard Wheel 100C15 was used, holding to limits of .0003".

The cast iron saw table shown at left was ground from rough iron casting with a 30C30 Segment Wheel. In spite of the thin section of this casting, the broad table surface is ground flat within .004". .

Blanchard knows how to fit the wheel to the work and will welcome the opportunity to help you achieve best results. Write today!

The Booklet "Blanchard Wheels" contains helpful information on the selection of grinding wheels for all kinds of work—sent free on request.

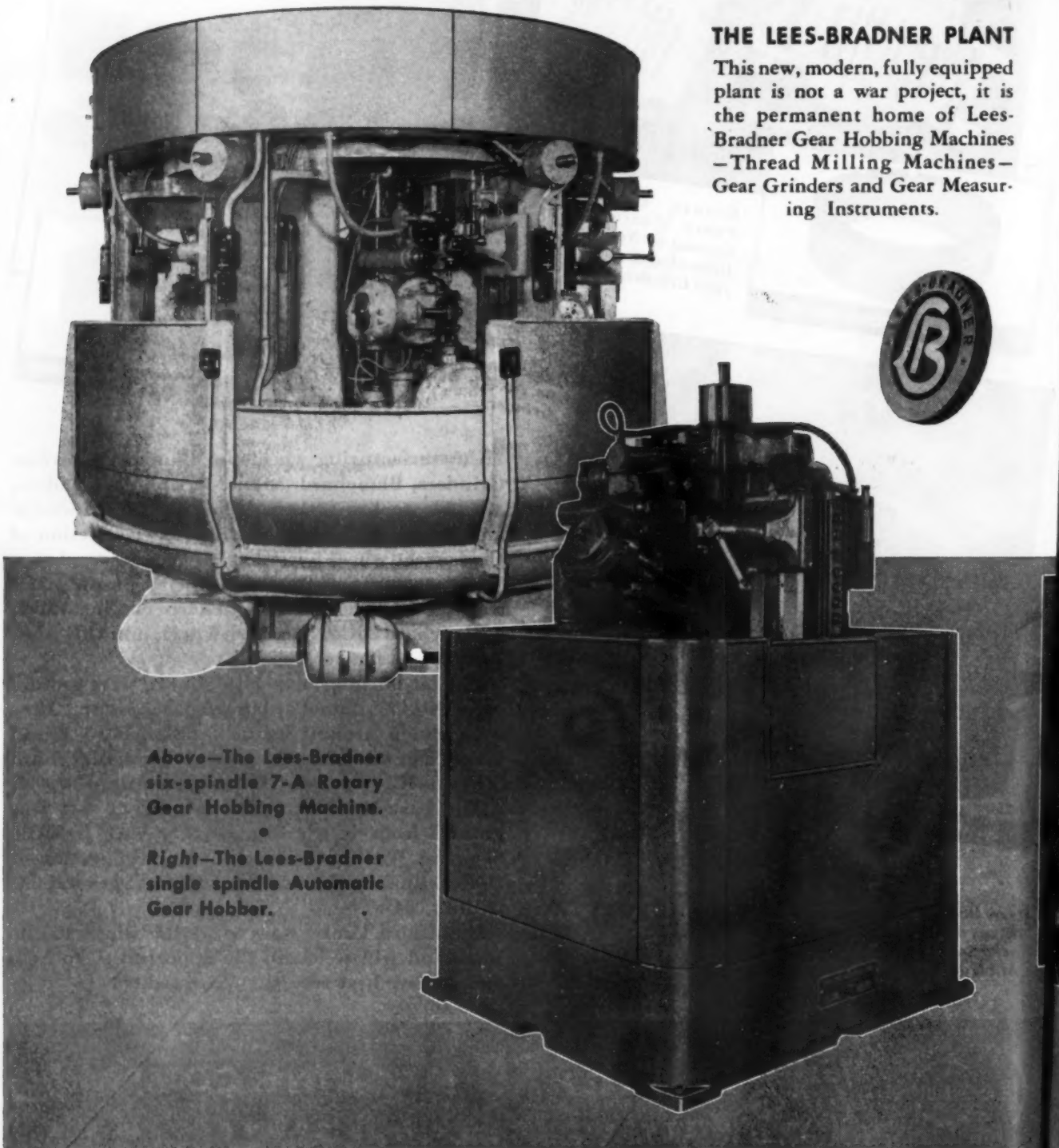
BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

THE LEES-BRADNER PLANT

This new, modern, fully equipped plant is not a war project, it is the permanent home of Lees-Bradner Gear Hobbing Machines —Thread Milling Machines— Gear Grinders and Gear Measuring Instruments.



***Above*—The Lees-Bradner six-spindle 7-A Rotary Gear Hobbing Machine.**

•

***Right*—The Lees-Bradner single spindle Automatic Gear Hobber.**

KEEP IN THE LEAD WITH Lees-Bradner HOBBING MACHINES

Rotary and Single Spindle

● Lees-Bradner pioneers of modern high production gear hobbing originated and developed this line of precision machines. The Rotary is built in 4-6 and 8 spindles and is used for the generation of spur and helical gears, sprockets and splines.

Operation is extremely simple as operator merely loads machine, presses a button and all other functions are performed automatically by the machine.

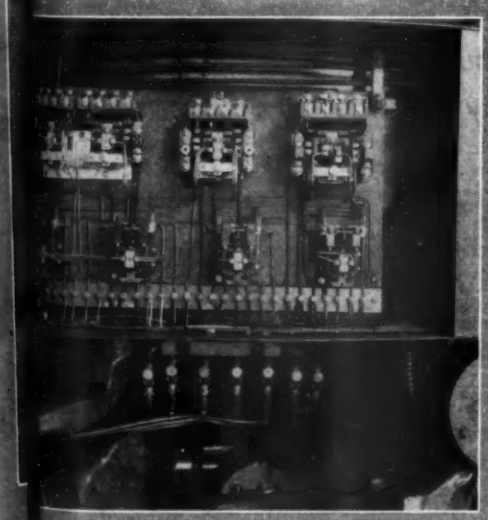
The Rotary is generally speaking a mass production machine and is ideal for the high production of a single job. However it will also handle several different jobs simultaneously, completing a piece in the time of one revolution of the table. Because of this flexibility the Rotary is adaptable to work on which the production might seem too low at first glance.

The Single Spindle Automatic Gear Hobber is also a high production machine of extreme accuracy. It will cut straight serrations, spline shafts, spur gears, helical gears—right or left hand angles up to 45 degrees. It has a capacity for gears up to 7 inches outside diameter and 9 inches face and pitches up to 4 diametral pitch in steel.

The operation of the machine is very simple—does not require skilled help—one operator can handle a battery of machines. The operator merely places work in the machine, presses a button and unloads the finished piece at the end of the cycle.

A battery of Lees-Bradner Production Hobbers at a prominent automotive plant had only 4 rejects out of 750,000 gears inspected. Records like this indicate how well these rugged machines maintain precision requirements and high production.

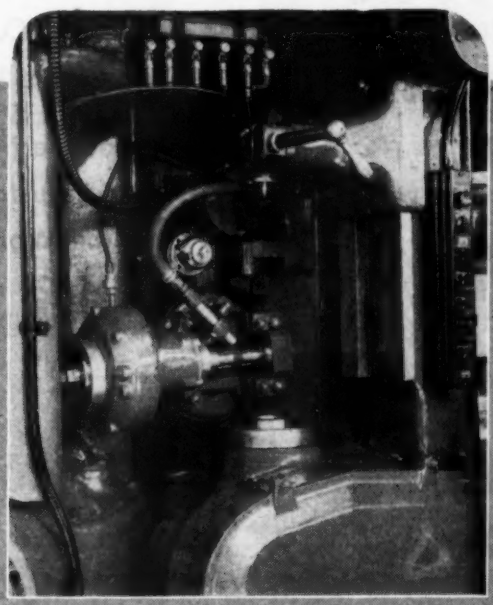
Consult Lees-Bradner on your precision hobbing work.



Left—Electric Panel arrangement for Rotary Gear Hobbing Machine.

●

***Right*—Close up of Hob Head—Work Spindle—and Push Button Control Switch.**



The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

"VASCOLOY-RAMET," TRADEMARK OF THE WORLD'S FINEST CARBIDE

WORLD'S FIRSTS

1922 *Tantalum* first produced on commercial basis.

1929 *Metallic Columbium* first produced.

1930 *Tantalum-Tungsten Carbide*, the first successful Carbide for machining steel.

1940 *Tantung* non-ferrous cast alloy containing Tantalum-Columbium Carbide. Hailed as the greatest contribution to the industry since the advent of Cemented Carbide.

1945 *Tantalum-Tungsten Carbide* and *Tantung Cutting Tools* are playing a tremendous role in the war production program.

In peace time these tools will continue to supply industry with the finest quality Carbide in the World.

Ta *(TANTALUM)*
Cb *(COLUMBIUM)*
TaC-WC *(TANTALUM-TUNGSTEN CARBIDE)*

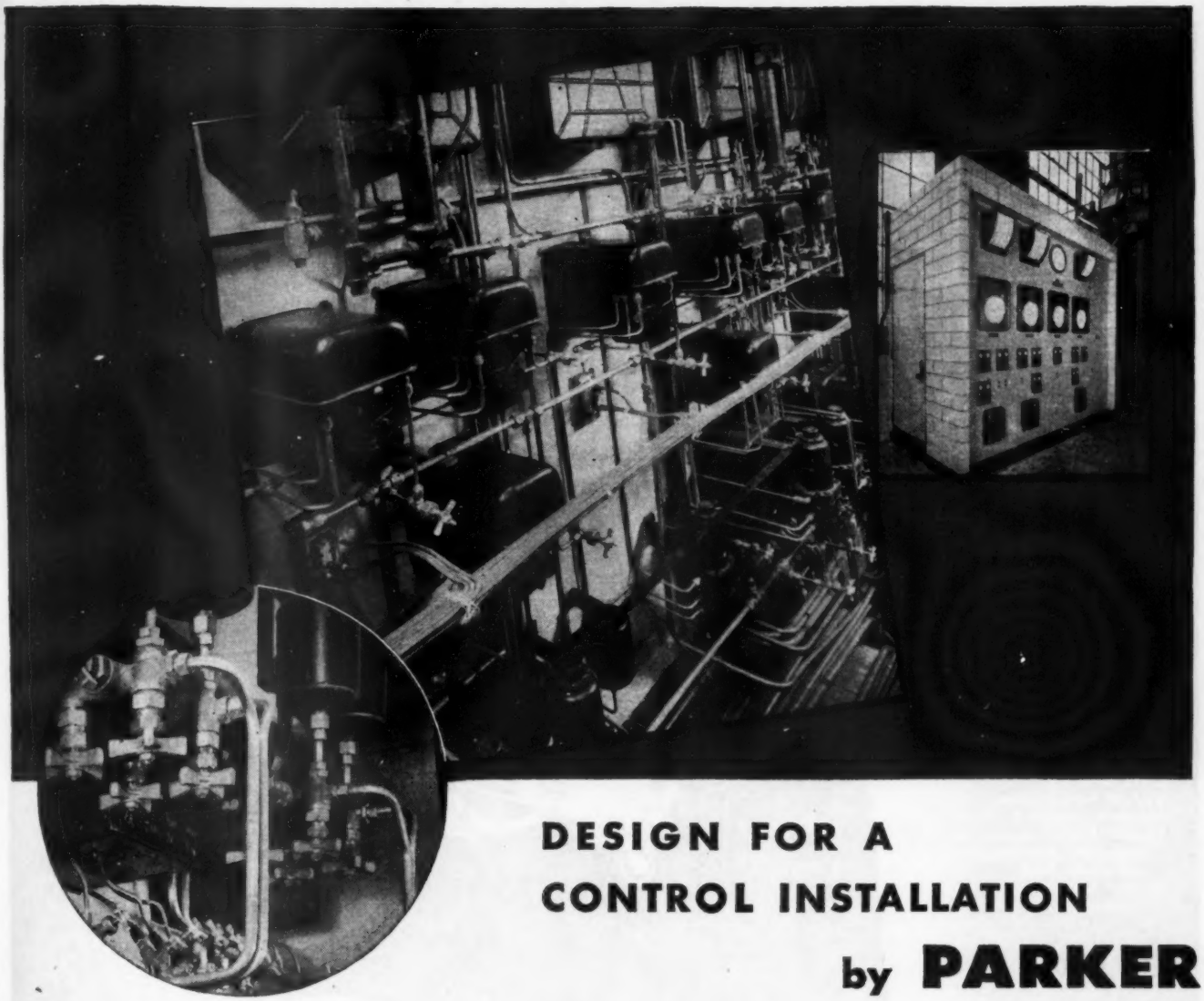
These "World's Firsts" were conceived and developed in Fansteel's laboratories. They were made available to the Vascoloy-Ramet Corporation thru its corporate affiliations and represent some of the most significant metallurgical achievements of the age.

Ramet
VASCOLOY RAMET CORPORATION

AFFILIATIONS: FANSTEEL METALLURGICAL CORPORATION • VANADIUM-ALLOYS STEEL CO.

TANTALUM-TUNGSTEN *(WORLD'S FINEST)* CARBIDE TOOLS AND DIES
TANTUNG CAST ALLOY CUTTING TOOLS

4510



DESIGN FOR A CONTROL INSTALLATION by PARKER

This boiler control installation is an example of Parker Fluid Power Engineering.

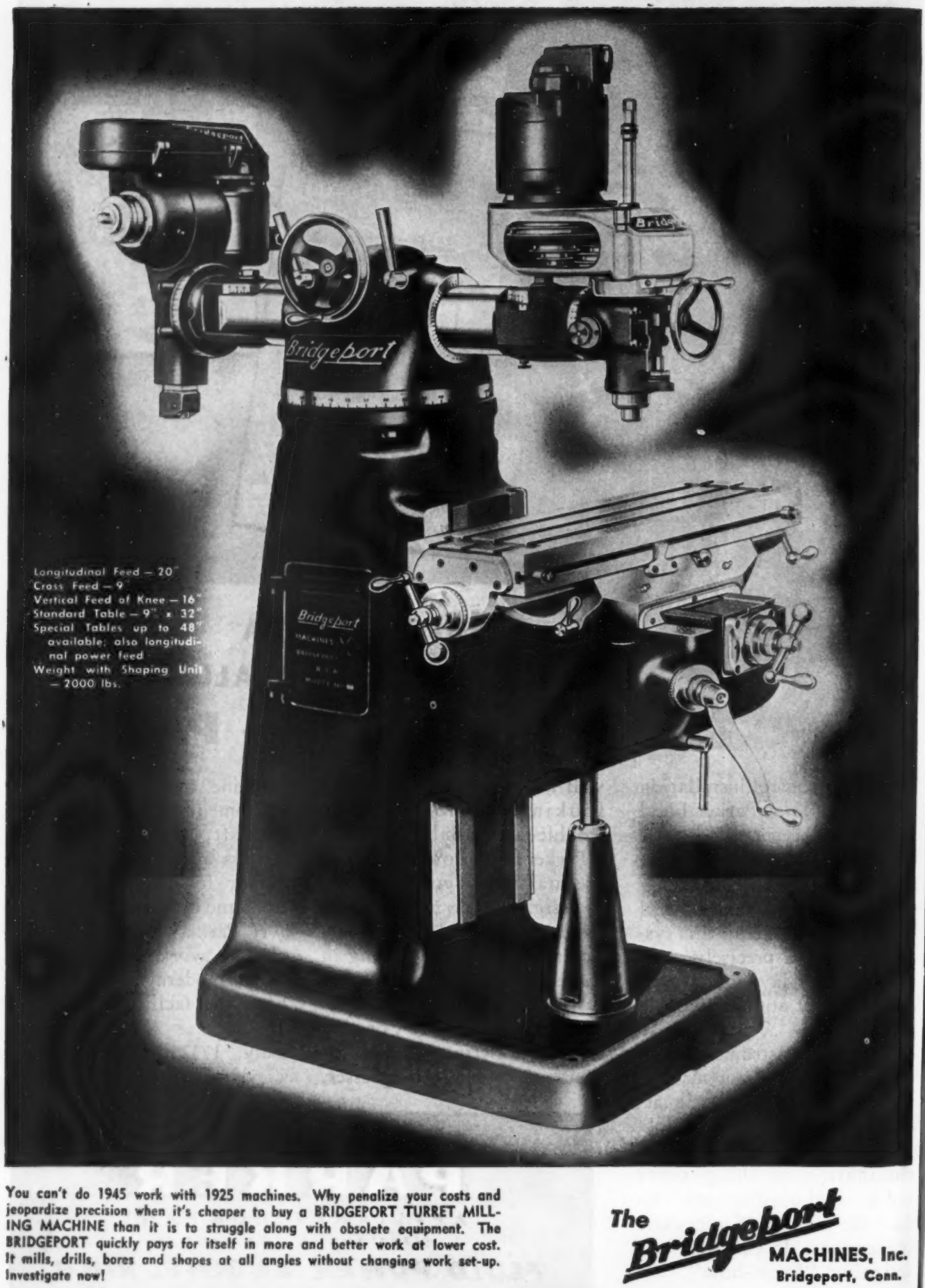
To guarantee the prompt and accurate registering action of the many meters and control devices that make up this system requires a precisely engineered tubing layout that will allow ease of application in a compact area . . . provide easy removal of instruments and control apparatus for maintenance or replacement . . . guarantee smooth flow and low pressure drop through the elimination of sharp turns and internal obstructions... reduce the number of joints and connections. It calls for the designing "know-how" that will insure a simplified, neat-looking, readily-serviced, trouble-free installation.

Parker Fluid Power Products are vital in this system. Specially designed to do the job. They have been proved by 20 years experience, and are serving in thousands of industrial piping installations.

If you are using . . . or plan to use . . . fittings, valves or fabricated tubing—on presses, machine tools, earth-moving equipment, motor vehicles, aircraft, refrigeration and process applications, look to Parker for effective installations and dependable products.

A Parker engineer will be glad to work with you, and three modern Parker plants have the facilities you need. The Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

PARKER



Longitudinal Feed — 20"
Cross Feed — 9"
Vertical Feed of Knee — 16"
Standard Table — 9" x 32"
Special Tables up to 48" available; also longitudinal power feed
Weight with Shaping Unit — 2000 lbs.

You can't do 1945 work with 1925 machines. Why penalize your costs and jeopardize precision when it's cheaper to buy a BRIDGEPORT TURRET MILLING MACHINE than it is to struggle along with obsolete equipment. The BRIDGEPORT quickly pays for itself in more and better work at lower cost. It mills, drills, bores and shapes at all angles without changing work set-up. Investigate now!

The Bridgeport MACHINES, Inc.
Bridgeport, Conn.

NEW WELDING CONTROL

GOOD FOR ALL 3

SPOT
PULSATION
SEAM

Flip this switch to change the control from spot or pulsation to seam welding.

New CR7503-C110 welding control. Inset shows the master control station, which can be removed for mounting on the welding machine.

Accurate timing · Smooth heat adjustment · Fully electronic

As this control is of the synchronous-precision type, it provides the accurate repetitive timing, even with instantaneous or sustained line-voltage variations, so essential to highest-quality welding. This control, the most versatile of all G-E resistance-welding controls, is not only ideal for the types of work given below, but it can also be used where it is desirable to do all three types of work on one machine.

Spot or Pulsation Welding

This control is particularly well suited for these two types of welding because of its wide timing range. It can be used in the welding of thin-gage metals where consistent timing of as low as one or two cycles may be required, in the welding of heavy-gage metals or in projection welding where pulsation welding may be required, or in special welding applications where pulsation welding may be required with a minimum heat and cool time of one or two cycles.

The timing range in spot welding is from 1 to 30 cycles.*

In pulsation welding, heat and cool time, are independently adjustable from 1 to 30 cycles*, and the impulse-counting circuit is adjustable from 1 to 15 impulses—independent of heat or cool time settings. *When used on a 60-cycle power supply.

Seam Welding

Good seam welding is possible with this control because the accurate timing circuit and the independent adjustment of heat and cool time (in complete-cycle steps) eliminate timing variations and transient currents. Heat and cool time are independently adjustable from 1 to 30 cycles*.

Heat Control on All 3

Smooth heat adjustment is provided by the phase-shift method of heat control. This eliminates the need for many heat points on the welding transformer. In addition, a voltage- or current-regulating compensator can be added by simple interconnections. Also, this welding control when equipped with a tempering attachment makes possible good results in the spot welding of thin-gage air-hardenable steels.

*When used on a 60-cycle power supply

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Company.....

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AND ONLY 1 GRINDER

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Maximum efficiency, minimum machinery!

A successful midwestern manufacturer of Vernier Calipers, Height Gages and Squares uses only two pieces of machinery . . . A DoALL Contour Machine to cut the shapes, a DoALL Grinder to finish the entire output!

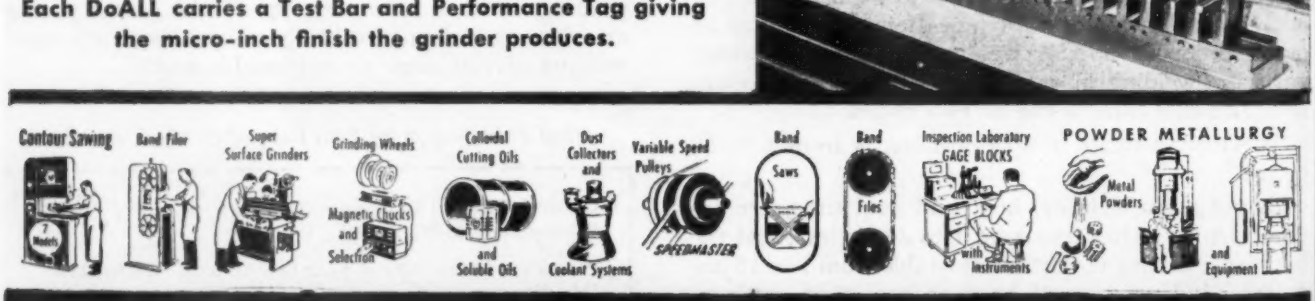
58 distinct grinding operations are required in the finishing of the 24" calipers alone; the DoALL Surface Grinder does them ALL with speed and utmost precision, demonstrating again its remarkable versatility for all types of grinding.

The lower illustration shows two dozen caliper jaws being ground at the same time.

Write for literature which gives full specifications of the DoALL Grinder.

THE GRINDER WITH CREDENTIALS

Each DoALL carries a Test Bar and Performance Tag giving the micro-inch finish the grinder produces.



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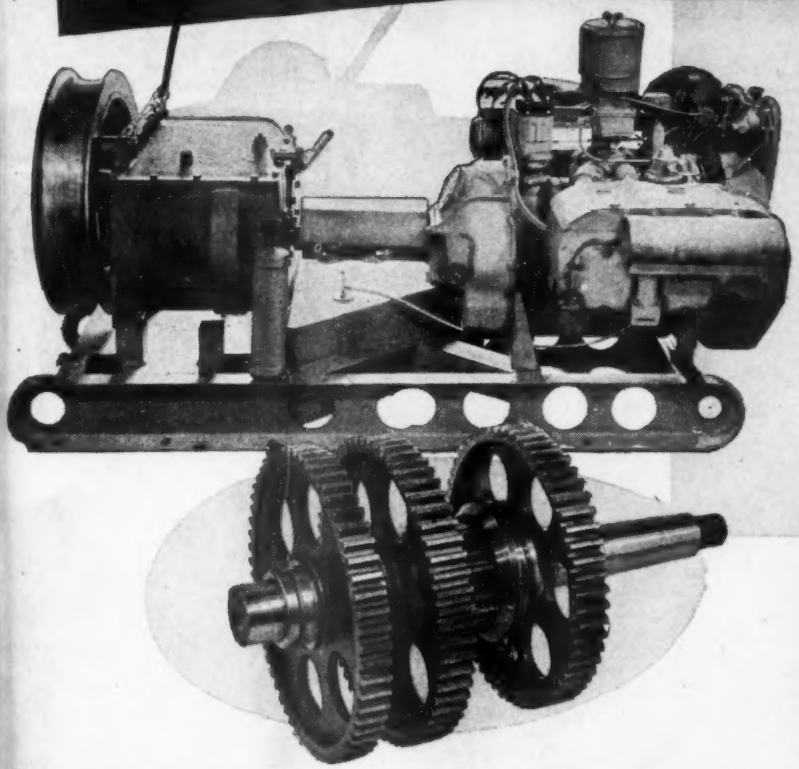
ORANGE ROLLER BUSHINGS PROVE *Cooler Running* IN GEAR BOX OF AERIAL TRAMWAY



"Never before such a satisfactory test . . ."

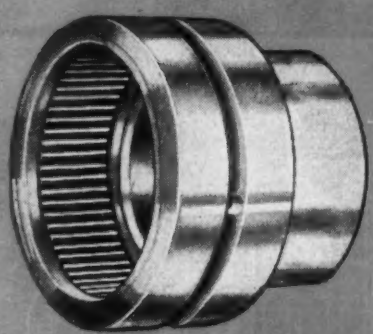
Reports Precision Tool & Mfg. Co., Syracuse, N. Y.

". . . we never before put more than 35 h.p. through either the light or heavy drive unit. In this test we went to 40 h.p., well within permissible rise from ambient temperature. First time we have been able to run tests where efficiency was same in forward as in reverse."

When rotating parts run too hot, you can be sure friction and wear are at work. Best preventive is a liberal application of Orange Roller Bushings throughout your product, to obtain the fullest measure of smooth-running, anti-friction protection. Here's why:

Orange Roller Bushings are made to extreme standards of precision. Rollers and raceways are highly finished. Roller clearances are held to a minimum—all internal running clearances are closer, maintaining true alignment of rollers with the raceways. Efficient lubrication is assured at all times.

Orange Roller Bushings are available in a full range of sizes and types to meet practically all requirements. Write for Engineering Data Book showing design, sizes, capacities, installation data, etc.



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Please send me your Roller Bushing Data Book

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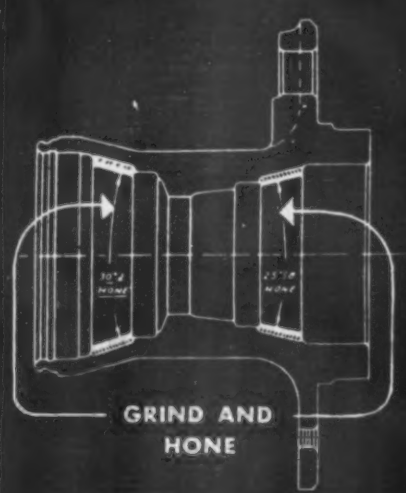
Two hardened taper bearings are simultaneously and automatically finished in 55 automotive wheel hubs per hour to tolerances of .001" and 3 micro inches with this Cross Special Machine, while producing an annual profit of 35% on the investment.

Your manufacturing problems can be converted into similarly successful operations—consult Cross.

THE CROSS COMPANY, DETROIT 7, Michigan, Department 101



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for automatically performing any one or a combination of metal cutting operations
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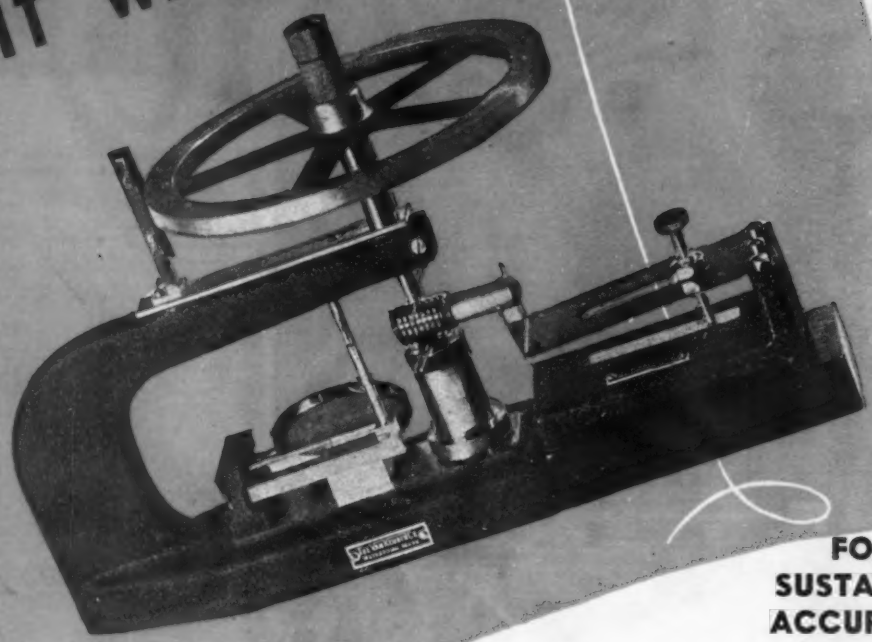
Van Keuren

LIGHT WAVE MICROMETER



FOR SUSTAINED ACCURACY

The Van Keuren light wave micrometer is described in catalog No. 33. This book also gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. *Write for your copy!*

NEW SYSTEM OF ACCURACY—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

CONTROLLED PRESSURE ASSURES UNIFORMITY—By using the sensitivity of light waves the light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

IDEAL FOR SHOP MEASUREMENTS—The light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the light wave micrometer. It is fast, accurate and profitable.

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

These Alcoa Aluminum Alloy die castings go into the Gurley Model 132-B Precise Transit.

Army Engineers at work with Gurley Precise Transit on the Alcan Highway. Photograph by U. S. Army Signal Corps.

They get there with

Alcoa Aluminum Alloy Die Castings

Surveyors "stay on the beam" when they're working with this Gurley Precise Transit. Accurate when it leaves the factory, it stays that way, for the dimensions of these aluminum alloy parts are permanent. There's no creeping or growth when die castings are made of strong aluminum alloys.

Manufacturers find that Alcoa Aluminum Alloy die castings speed up their work. Dimensions can be close to finished sizes; very little machining is required before a part is ready for assembly.

Alcoa gives you your choice of die castings in aluminum or magnesium. Both metals have permanence of dimensions and provide high strength-weight ratios. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

but it *can't* measure UNBALANCE

THE most sensitive micrometer can only measure *outside* dimensions, not the hidden flaws which give rise to unbalance . . . and its destructive partner, *vibration.* They may lurk beneath the smoothest finish . . . render the most carefully made product unfit for service.

Fortunately, they can't escape modern electronics. The meter of a Gisholt Dynetric Balancing Machine* will even register an unbalance vibration of .000025". Not only that, but have it *located, measured* and *ready for correction* —all in a few seconds' time!

Remember, no rotating part is really doing its job when the slightest vibration exists. Ignore it, and you open the door to overloaded bearings, lost precision and premature wear.

Why not play safe? Gisholt Dynetric balancing improves any rotating part. Write for specific information.

**A development of Westinghouse Research Laboratories and Industrial Electronics Division.*

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1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

DYNETRIC BALANCING MACHINES *provide accurate static and dynamic balance for low-speed as well as high-speed assemblies. No part that turns is truly efficient without it.*

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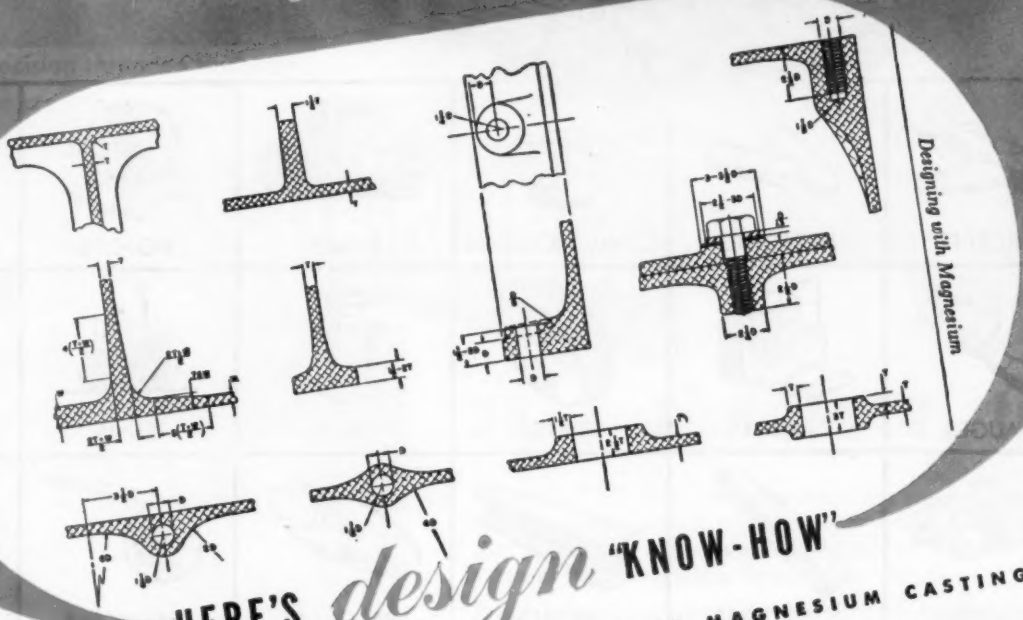
AMERICAN MAGNESIUM CORPORATION OFFERS YOU "KNOW-HOW" IN

design...manufacturing



HERE'S *design* "KNOW-HOW"

EXAMPLES OF SECTION JUNCTIONS AND EMBOSSING IN MAGNESIUM CASTINGS

Help yourself to more than twenty years of experience in working with magnesium. American Magnesium will gladly share the "know-how" gained through many years of designing, manufacturing, and assembling magnesium parts.

This experience translates itself into better products for you—more efficient designs, maximum savings in weight. Then, as you place your designs in production, look to American Magnesium for dependable castings, forgings, extruded shapes, and sheet.

May we assist you in employing the weight-saving properties of magnesium to best advantage? Write to Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

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SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

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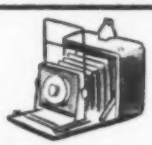
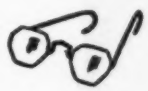
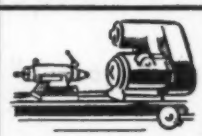
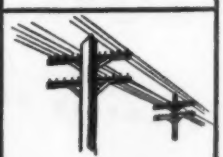
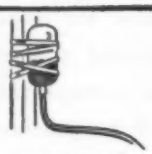
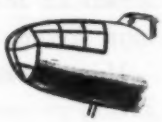
GAUGES	 CAMERAS	TIRES	MILK	SHIPS	 OPTICALS
AUTOMOBILES	MUNITIONS	METALS	RECORDS	CHEMICALS	TEXTILES
MAPS	OIL	RADIO	X-RAY FILM	 MACHINE TOOLS	 COPPER
PAINT	 PLASMA	 PLASTICS	GEARS	WATCHES	PARACHUTES

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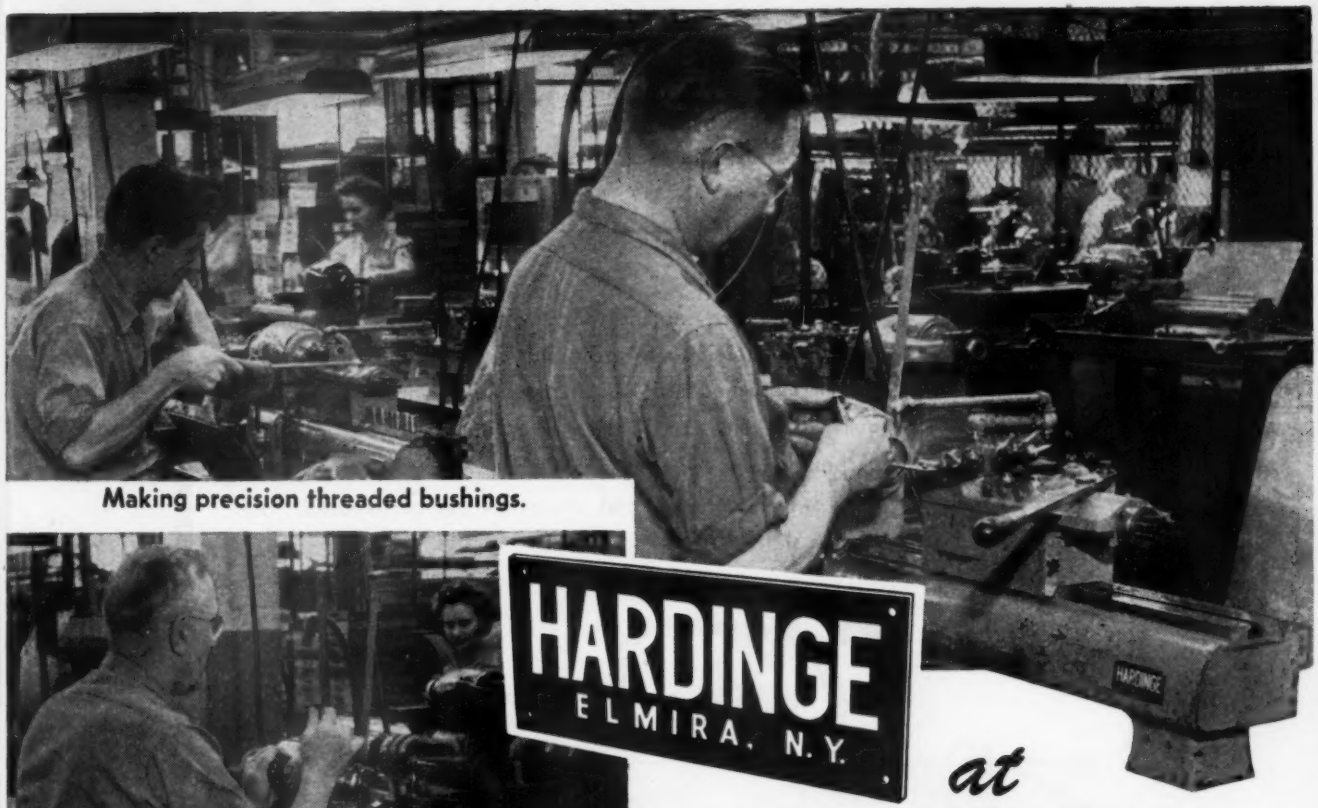

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Turning angle face of generator rings to length.

Facing retaining rings.

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Since 1917 Bill Jack has been heading companies which manufactured precision parts, so it was only natural that Hardinge lathes were selected for precision operation at Jack & Heintz, Inc. of Cleveland.

Jahco now manufactures automatic pilots, flight instruments, engine starters, generators and other aircraft units requiring high precision tolerances customarily being inspected to a few ten-thousandths. Some parts of these instruments are more delicate than a watch yet Jahco makes them on a volume production basis.

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HARDINGE BROTHERS, INC.
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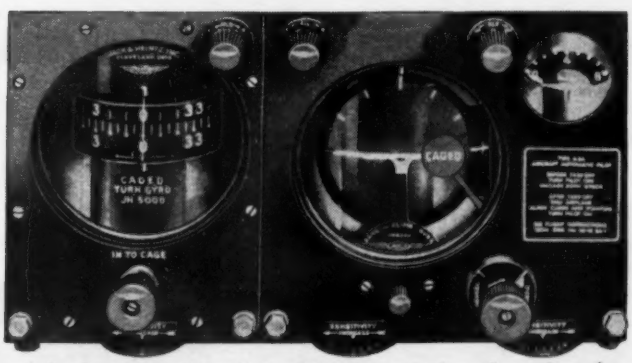
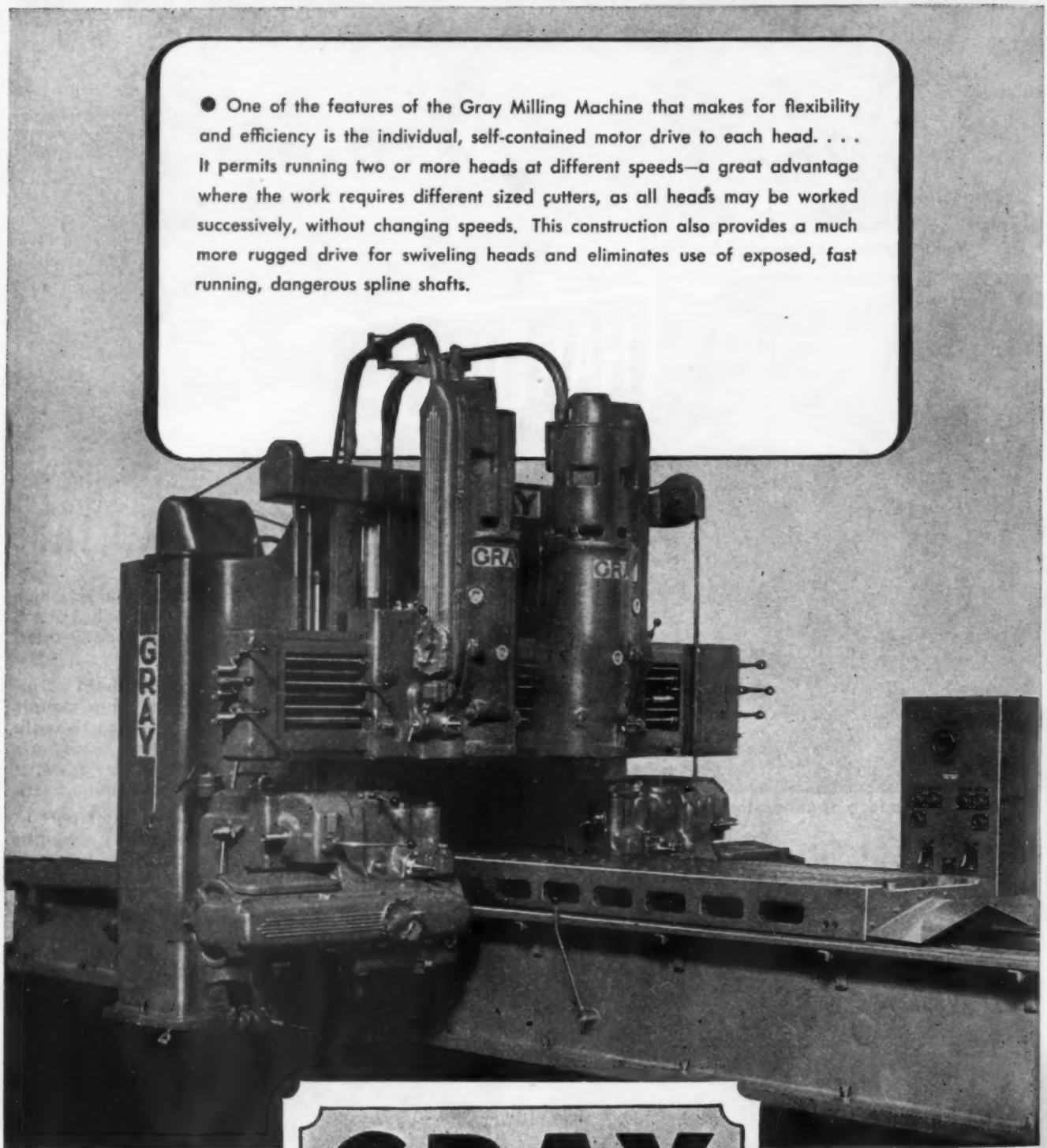


Jahco automatic pilot which keeps the plane level and on the course set.

FLEXIBILITY!

● One of the features of the Gray Milling Machine that makes for flexibility and efficiency is the individual, self-contained motor drive to each head. . . . It permits running two or more heads at different speeds—a great advantage where the work requires different sized cutters, as all heads may be worked successively, without changing speeds. This construction also provides a much more rugged drive for swiveling heads and eliminates use of exposed, fast running, dangerous spline shafts.



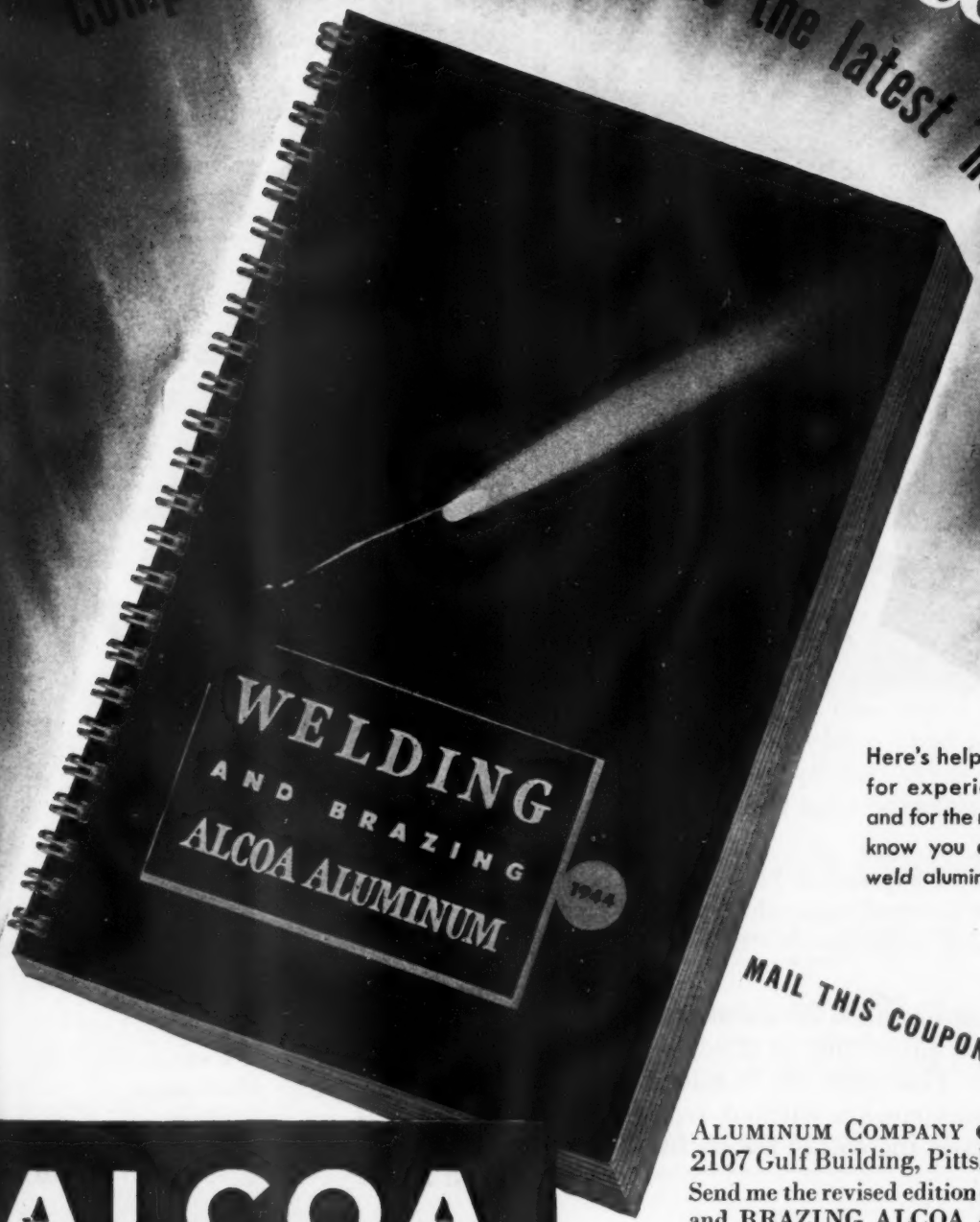
GRAY

THE G. A. COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE—Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

IT'S NEW!

Completely revised to include the latest "how-to-do-it" data



Here's helpful information for experienced workers and for the man who "didn't know you could *weld* aluminum."

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Send me the revised edition of WELDING and BRAZING ALCOA ALUMINUM

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ALCOA
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PLUS THE ECONOMY OF EXPANSION REAMERS—

IN THIS ONE SUPERIOR STAPLES TOOL

The Staples Expansion Reamer is made with the tool body solid—not split. This construction gives rigidity and accuracy which the usual expansion reamer cannot offer.

The range of expansion is from .004" to .020". The tapered expansion plug permits easy tool adjustment to 1/10,000 of an inch.

Each expansion adds clearance to the cutting blades, presenting in effect a new cutting edge. This *exclusive* Staples feature permits expansion without regrinding, thus greatly increasing the useful life of the tool.

The Staples Expansion Reamer, with its special patented features, is ideally suited either to present demands for high production or future demands for lowered production costs. Send for the Staples catalog of quality cutting tools, including *standard tools available from stock.*

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Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

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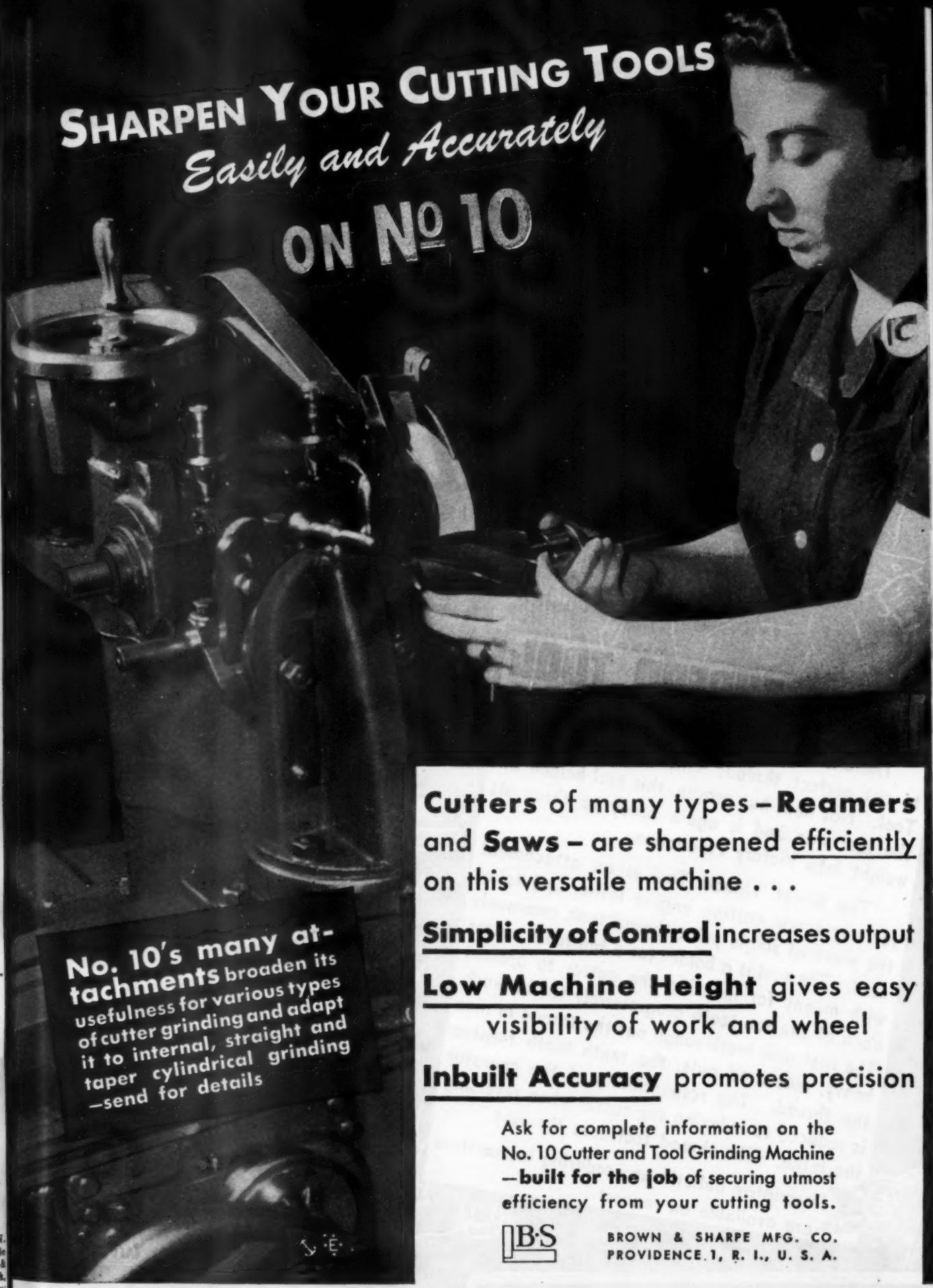
SHARPEN YOUR CUTTING TOOLS
Easily and Accurately
ON Nº 10



No. 10's many attachments broaden its usefulness for various types of cutter grinding and adapt it to internal, straight and taper cylindrical grinding —send for details

Cutters of many types – **Reamers** and **Saws** – are sharpened efficiently on this versatile machine . . .

Simplicity of Control increases output

Low Machine Height gives easy visibility of work and wheel

Inbuilt Accuracy promotes precision

Ask for complete information on the No. 10 Cutter and Tool Grinding Machine —**built for the job** of securing utmost efficiency from your cutting tools.

B·S BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

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NEVER TOO YOUNG OR TOO OLD *to* CUT PERFECT THREADS

RIVETT THREAD TOOL

There is an army of unskilled operators ready to cut perfect threads with the Rivett Thread Tool. Not new, but proven, this tool helped win the last war and is again ready to throw its weight into Victory Production.

The Rivett Thread Tool is an attachment for any screw cutting engine lathe, and takes the place of single point thread tools commonly used. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth progressively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. The thread tool does the rest.

Descriptive bulletin and ordering instructions are available on request.

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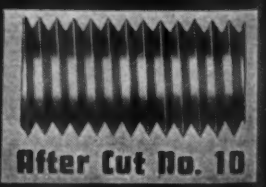
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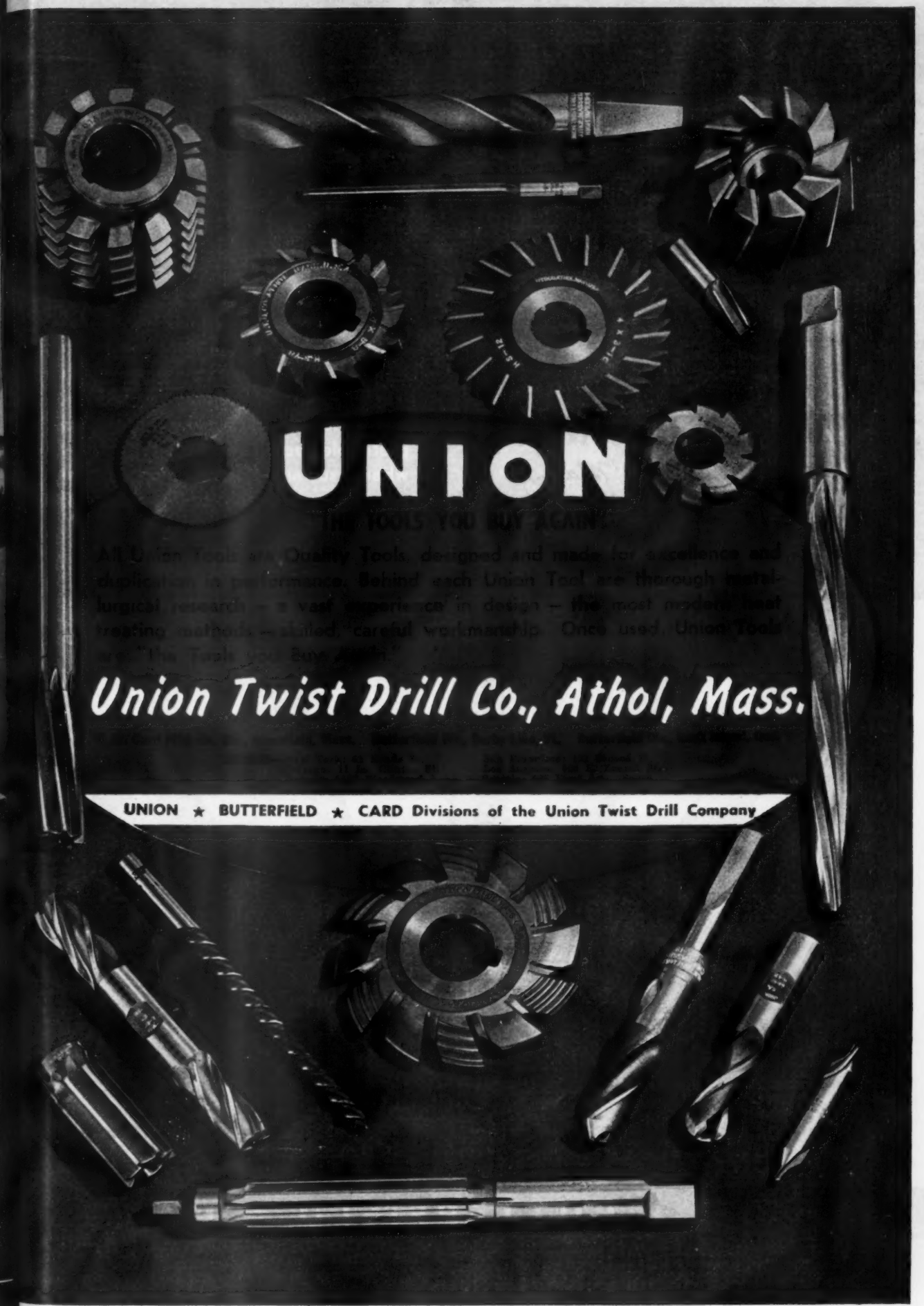
LATHE & GRINDER INC

BRIGHTON·BOSTON·MASS

MARCH


UNION
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

Increased production facilities enable Card to make prompt Deliveries in all sizes and types. Exceptionally high quality uniformly maintained, and unquestioned accuracy make these Tools profitable equipment in the shops where sustained production is the difference between profit and loss.

UNION ★ BUTTERFIELD ★ CARD

THE STANDARD FOR PRODUCTION

BUTTERFIELDS!

BUTTERFIELD DIVISION
Derby Line, Vt., Rock Island, Que.

Butterfield conventional Pipe Taps. Inserted Chaser Pipe Taps. Mud Plug Taps—their line is complete as to range of sizes . . . each Tap producing long runs of high quality, accurate threads under heavy duty conditions. Specify "Butterfields" – the standard for production—to get maximum service!

STORES: New York, 61 Reade St.—Chicago, 11 So. Clinton St.—Cleveland, Hal. W. Reynolds, 3346 Superior Ave.—Detroit, 5527 Woodward Ave.—Los Angeles, 524 E. Fourth St.—Toronto, 137 Wellington St., West—Montreal, 111 St. Paul St., West—Winnipeg, 403 Travellers Bldg.—Vancouver, 327 Shelly Bldg. Agents for Great Britain: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

Divisions of the Union Twist Drill Company

FOR HEAVY WORK IN STEEL AND CAST IRON

• Surface broaching is being used for machining many steel and cast iron parts on which fairly large quantities of metal must be removed. On the fuse body illustrated, 325# of steel are removed per hour in broaching the tongue and wrench slots at 1000 pieces per hour. Surface broaching is being increasingly used in many new fields for similar work. We will be glad to work with you on your problems, giving you the benefits of our long experience in this newest of machining methods. Just write or wire for our recommendations.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

MOVE UP THE SCHEDULE ☆ WIN THE WAR QUICKER

Footburt Patented Tooth F

FOOTBURT *Surface Broaching*

IF IT IS YOUR JOB . . . TO TURN OUT SHELLS *on time*

BE GUIDED BY THIS PRODUCTION REPORT

KENNAMETAL FINISH-TURNS 5500 105mm SHELLS at Carbide Cost of 1/4¢ per shell

PLACE

One of America's most important shell-turning plants.

JOB

WORK PIECE: 105mm shell, forged steel, heat-treated to Brinell hardness of 370 to 390.

OPERATION: Finish-turning SPEED: 425 SFM

DEPTH OF CUT: .030" FEED: .017"

TOOLS

Gang of four tools, each having clamped-on Kennametal tip, Grade K3H, 3/8" x 1/2" x 1-1/2". Tips are advanced and resharpened until they become too small to clamp (see illustrations above). Chip control obtained by unusual carbide-conserving procedure that will be explained on request.

PERFORMANCE

5500 shells finish-turned during life of set of four Kennametal tips. One operator usually finish-turns about 550 shells per shift. High production rate maintained because tip breakage from operating or grinding strains is negligible.

COST

Tip cost per shell—approximately 1/4c. Amount of Kennametal used in finish-turning one shell—approximately .036 gram.

This shell-turning production report clearly shows that America's metal-working industry has the inherent capacity to meet the requirements of the heavy shell program—provided that effective use is made of Kennametal, the tough, strong, steel-cutting carbide that contains an extremely hard intermetallic compound ($WTiC_2$), found in no other known tool material.

The finish-turning operation on 5500 shells, as described, required only 196 grams of Kennametal—about .036 gram per shell. This is representative of the economies effected on all shell-turning operations wherever Kennametal is used.

It is important to remember that Kennametal performance is predictable, under known conditions of use and maintenance, because its uniformity is precisely maintained by rigid chemical and metallurgical tests at every stage of manufacture

Our field engineers are fully equipped to help you obtain maximum shell production, with minimum consumption of carbide, through proper application and use of Kennametal tools.

Catalog 44 lists addresses of field offices, and describes Kennametal. A copy is yours for the asking.

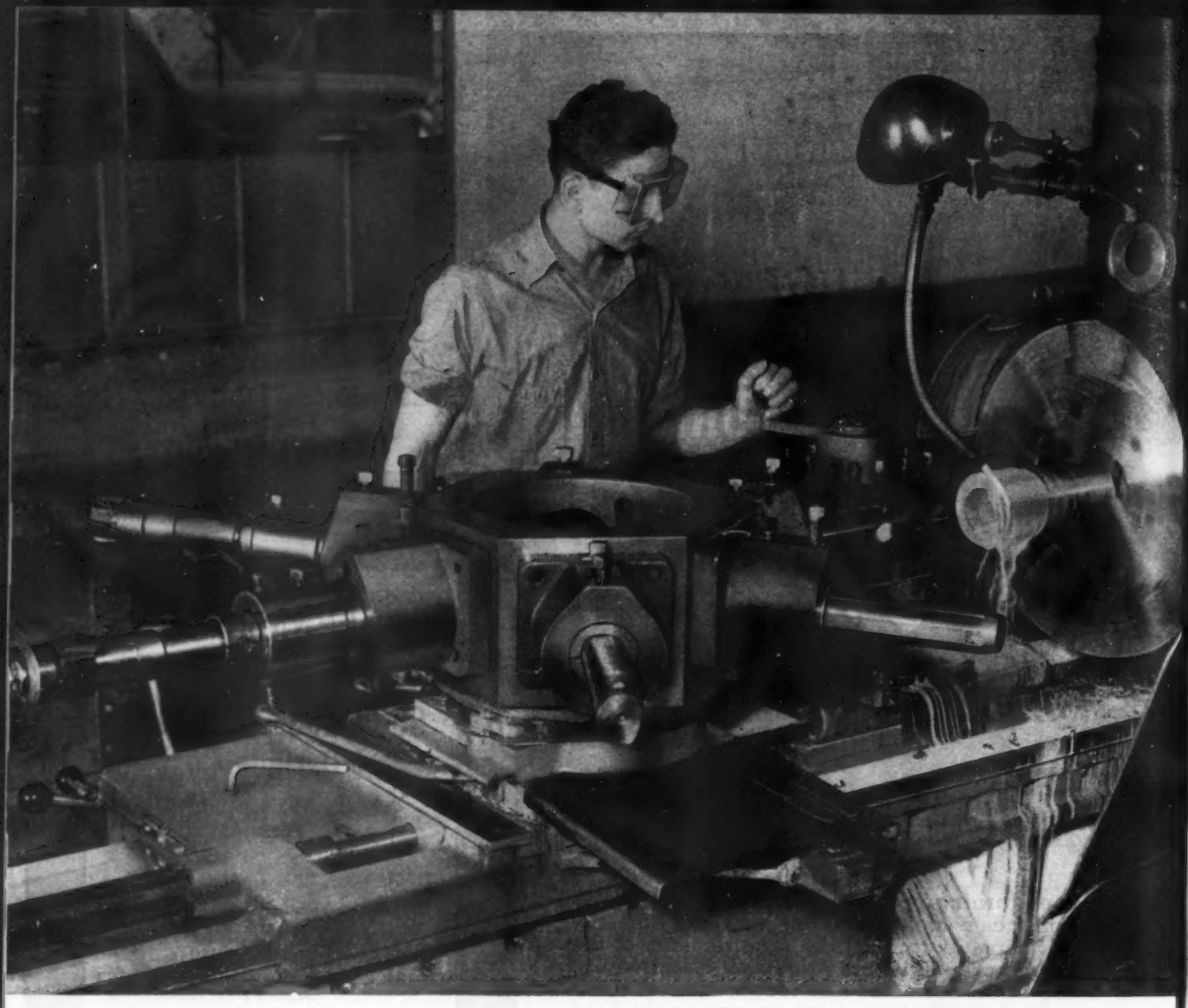
KENNAMETAL

SUPERIOR CEMENTED CARBIDES

TRADE-MARK REG. U. S. PAT. OFF.

KENNAMETAL Inc., LATROBE, PA.

WAREHOUSES IN: CHICAGO DETROIT • PHILADELPHIA NEW YORK SAN FRANCISCO

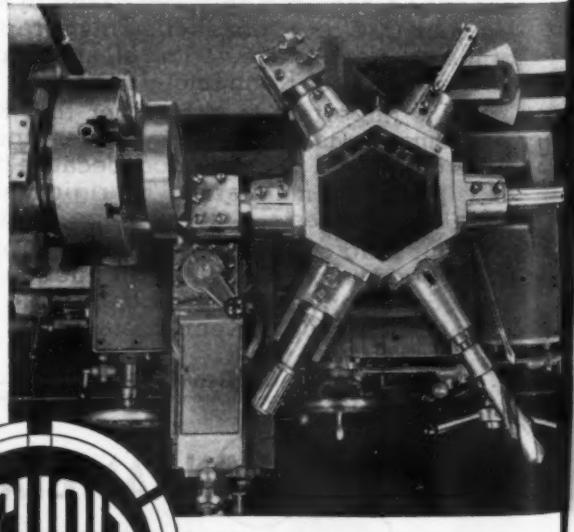


AN IMPORTANT ADVANTAGE...on both large and small lots!

GISHOLT'S CROSS-FEEDING HEXAGON TURRET gives you a more versatile machine—enables you to perform a number of cutting operations on the face or interior of the work piece while the outside diameter is being turned by the square turret. It permits you to make more use of multiple cutting. Tool investment is reduced, set-up time is shortened for a wide variety of work.

On small lot jobs, the Gisholt cross-feeding hexagon turret is particularly useful. Plain forged cutters, simple tool holders and single-point stub boring bars can be used for boring, facing, recessing, etc., where small numbers of parts do not justify elaborate, multiple tooling set-ups.

Sixteen power feeds with adjustable feed trips are provided for both cross and longitudinal feeds. Direct reading plate on the feed lever shows feeds in thousandths of an inch. These are engaged or disengaged by quick releasing levers. Write for literature.



The cross-feeding hexagon turret can be furnished instead of the fixed-center turret in all five sizes of Gisholt Saddle Type Turret Lathes. It can be firmly positioned on center line for large lot production with multiple tooling and pilot bars the same as any fixed-center machine.

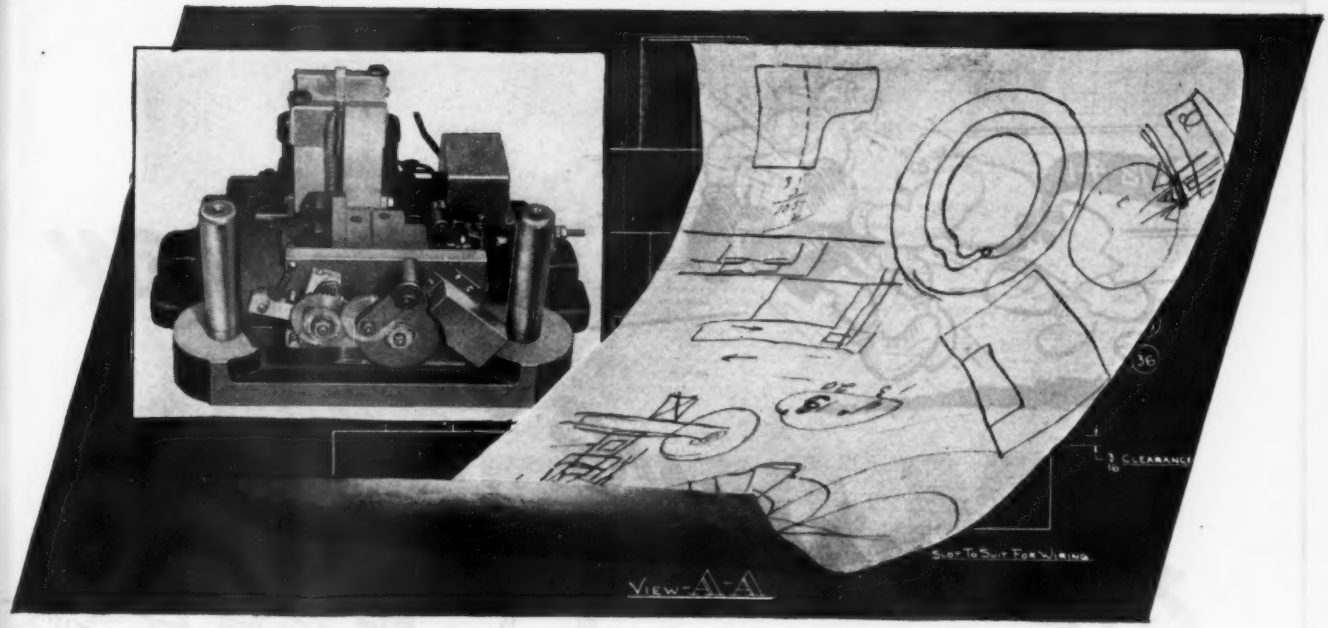
GISHOLT MACHINE COMPANY

1201 East Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



"As iron sharpeneth iron so a man sharpeneth the countenance of his friend"

A Proverb of Solomon

Recently Vulcan's Chief Engineer walked out of a conference with a radio manufacturer's Tool Development Engineer and Vulcan's Executive Production Head, carrying the doodle pictured above.

As the conference progressed the doodle had become a sketch of a very original and clever die. Later the doodle became a real sketch, then a design, then a blueprint.

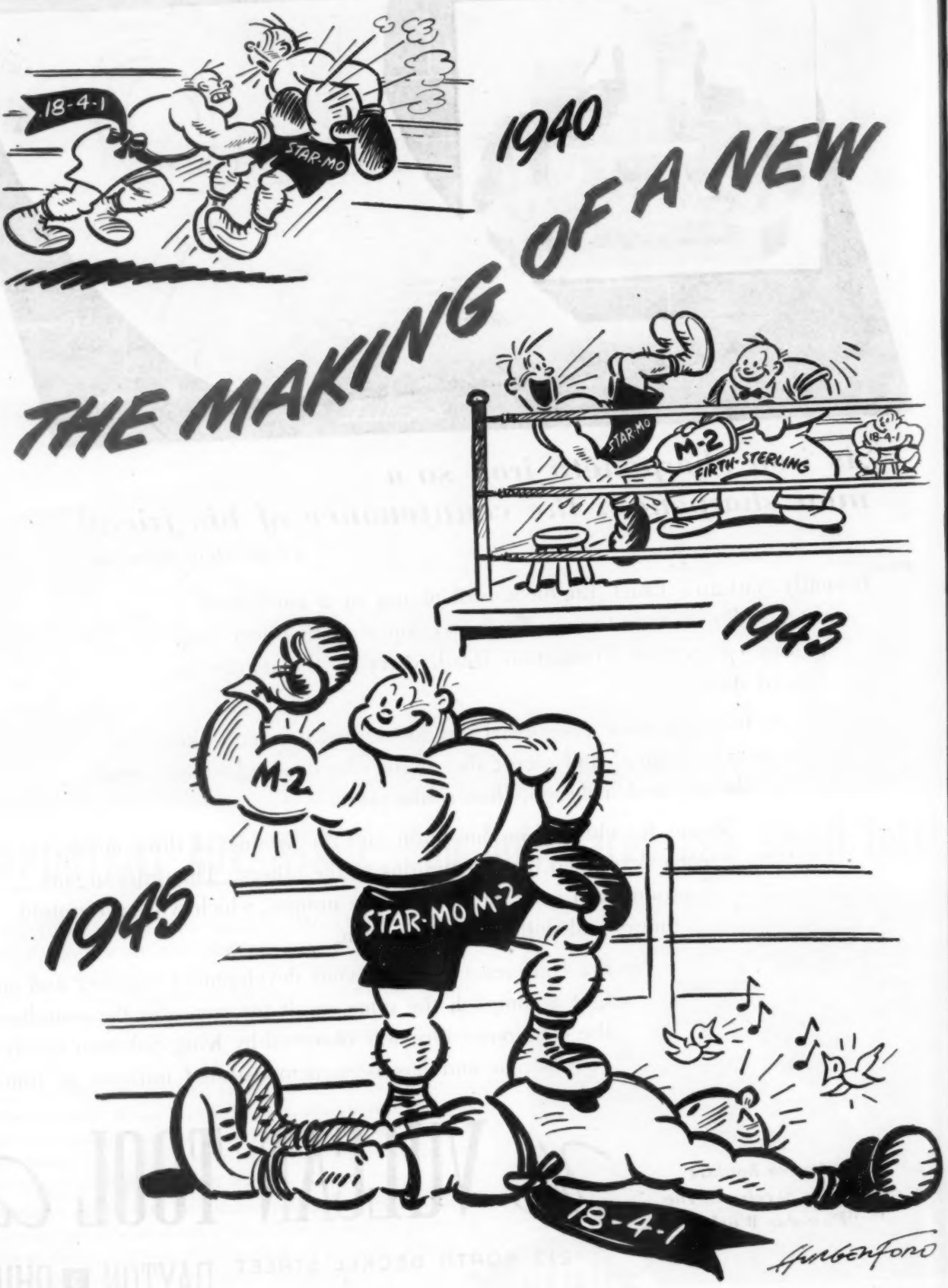
It was the child of no one brain, but the product of three minds, each sharpened by the stimulus of the others. This inter-organization team work produced a die unique, which will save untold hours and dollars in production.

Such a conference between your development engineer and ours might accomplish the same result for you—for the soundness of the conference idea was observed by King Solomon nearly 3000 years ago and has been demonstrated millions of times since.

Write for booklet "Vulcan Service in the "Post-war World"

The VULCAN TOOL Co.

213 NORTH BECKEL STREET DAYTON 3 OHIO


THE MAKING OF A NEW
1940
18-4-1
STAR-MO
1943
M-2
FIRTH-STERLING
1945
STAR-MO M-2
18-4-1

HIGH-SPEED CHAMP!

STAR-MO M-2

Improved

TUNGSTEN-"MOLY" HIGH-SPEED STEEL

Ever since the new "M-2" analysis was adopted for tungsten-molybdenum high-speed steel, more and more manufacturers in the automotive and tool-making fields are recognizing with approval and satisfaction this new Firth-Sterling champion, STAR-MO M-2.

They have seen this new steel in action. They find it excels 18-4-1 in their plants. They are supporting it with enthusiasm because it is giving satisfactory performance continually, and adding new accomplishments to its record. Why not give STAR-MO M-2 a try-out in your shop?

Better

Outcuts and outlasts 18-4-1 high-speed steel on most applications.

Costs Less

Base price is 14% less than 18-4-1 steels, and weight is approximately 7% less per foot. Let us quote.

Easy to Handle

Call in a Firth-Sterling Representative to discuss applications, heat-treating methods and practical advantages.

ARMY NAVY

Firth-Sterling
STEEL COMPANY

Which of these two men will produce the most work?

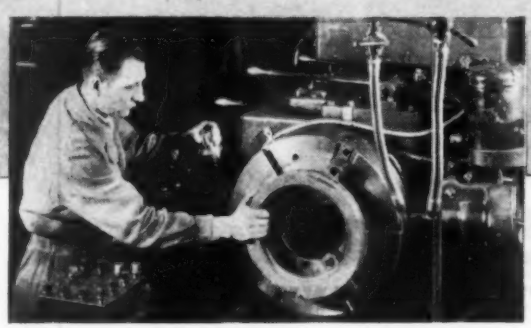
THESE two turret lathe operators are just about equal in every qualification—physique, experience, skill, and ambition. They are each working on the same type of Warner & Swasey turret lathe, producing exactly the same finished part.

Yet, at the end of the day, one operator will have produced about 20% more work—yes, and be less fatigued than the other fellow.

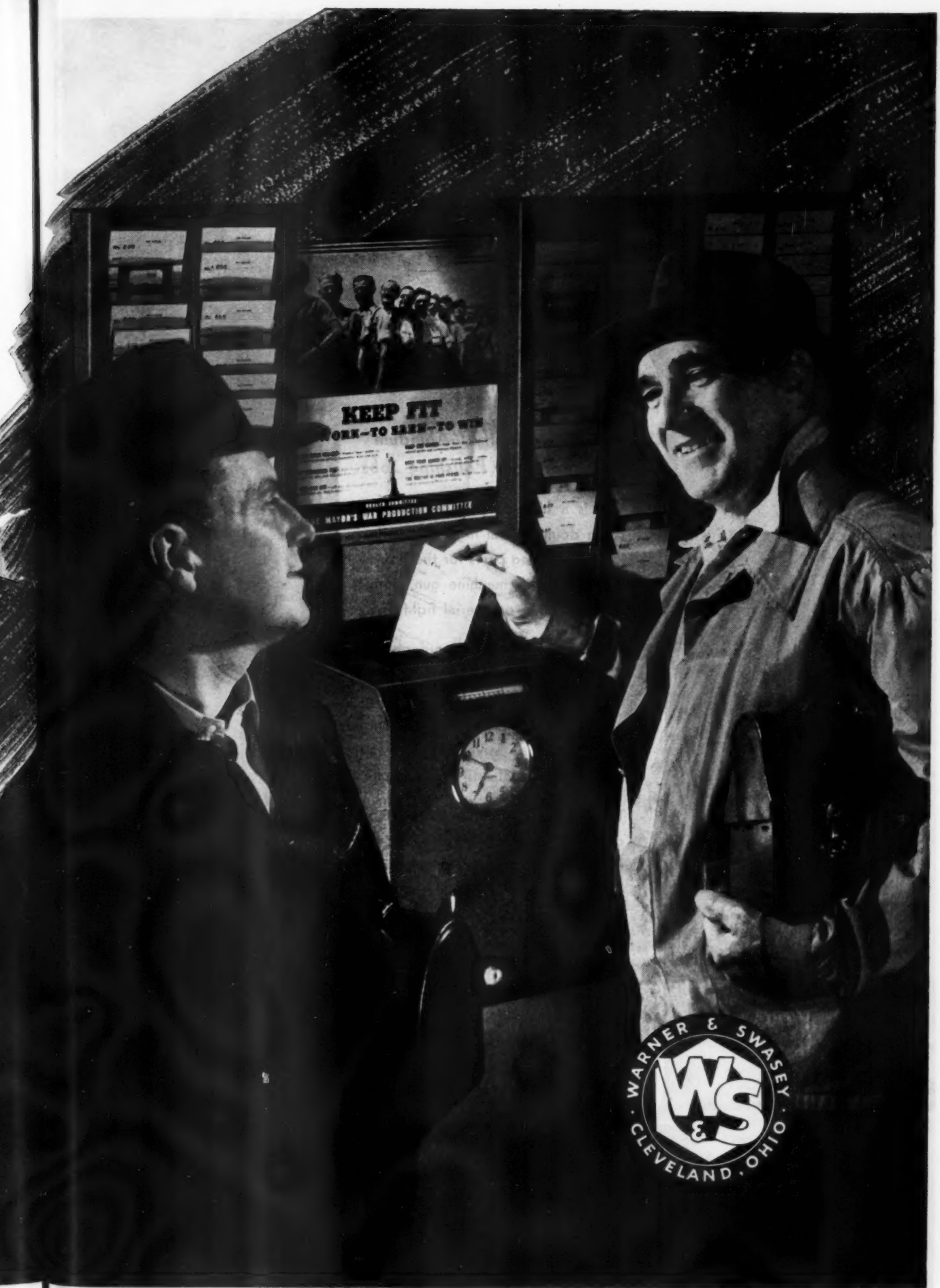
The reason lies wholly in the fact that the one operator has a power chuck wrench on his Warner & Swasey—the other has to chuck and release his pieces manually. Heaving and pushing on a chuck wrench takes time—and it takes a lot out of your operators, too. The result is a production sag as the day wears on.

Every superintendent or foreman who has power chuck wrenches on some of his turret lathes and not on others knows how much easier power chuck wrenches make it for their men. They know, too, that the increased production that comes from equipping their Warner & Swaseys with power chuck wrenches quickly pays for the improvement—in many cases in as little as 60 days.

Find out what Warner & Swasey Power Chuck Wrenches can do for you. Talk to your Warner & Swasey field man, or write Warner & Swasey, Cleveland, Ohio.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY


KEEP FIT
ORK—TO EARN—TO WIN
MAYOR'S WAR PRODUCTION COMMITTEE
WARNER & SWASEY
CLEVELAND · OHIO

When High Production is a "Must" . . .

Specify "Alundum" for Your Polishing Jobs

This is a high production polishing room doing a real high production job—producing parts for the Browning .50 caliber machine gun, popular weapon of our aerial fighters.

The High Standard Manufacturing Co., Inc. of New Haven, Conn., has found that Alundum Abrasive gives a real high production polishing wheel. The abrasive cuts fast and stays on the wheel until its job is done.

This ability of Alundum Abrasive to give high production is due to the chemical and physical characteristics that are built in when the abrasive is produced in the electric furnace and to the treatments that the abrasive receives as it is crushed, screened and prepared for use.

NORTON COMPANY
Worcester 6, Mass.

G-162

NORTON ABRASIVES

CUTS PRODUCTION COSTS

by Cutting Time On and Between Cuts

When you cut time on cuts and between cuts, production costs are also proportionately cut. Every one of the features built into the Bullard 36″ Cut Master Vertical Turret Lathe is aimed at cost savings.

Feeds and speeds are adequate for the fastest cutting tools. Rugged construction, screw feed for accuracy, smooth finish and power, metal-removing ability and ease of handling, make production of single piece jobs and larger runs equally profitable.

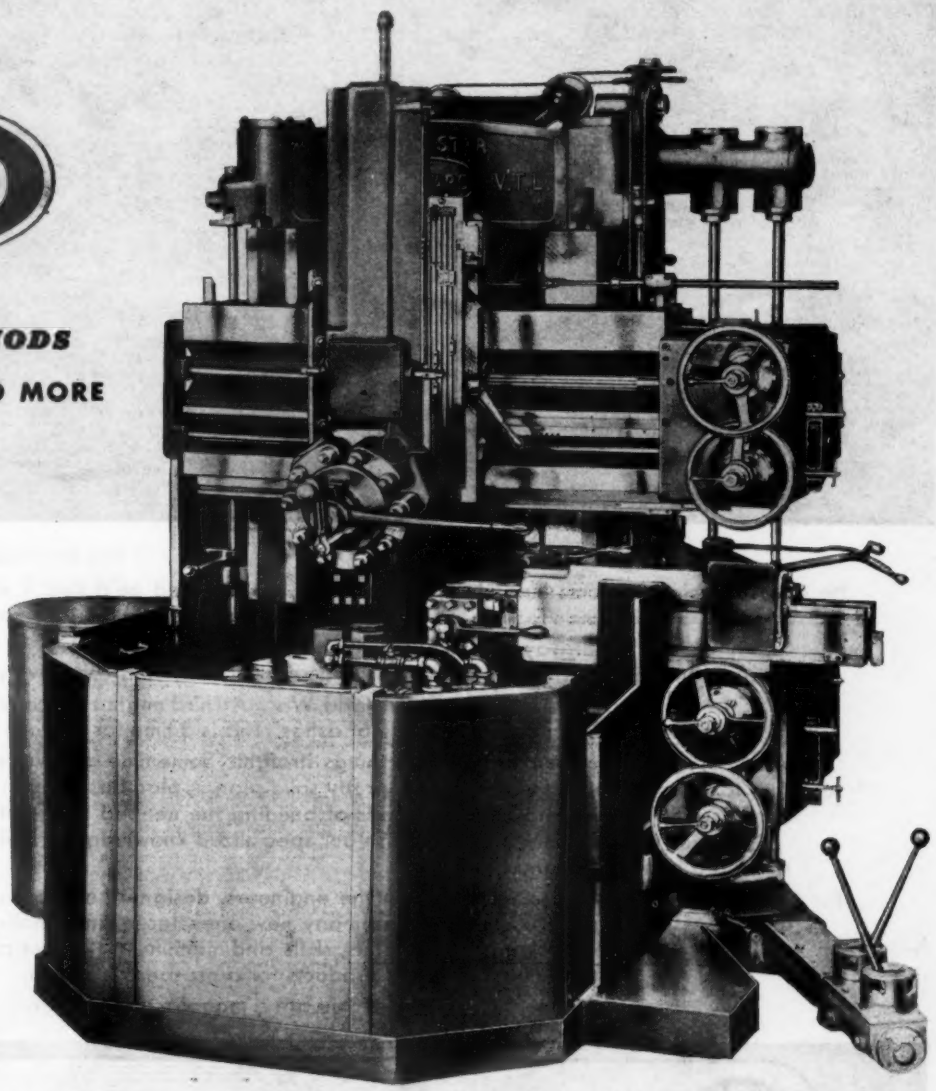
Notice these time-cutting features: speed changes made by two control levers within easy reach of the operator . . . unique Bullard chuck provides maximum grip with minimum wrench effort . . . easily adjustable main rail eliminates excessive overhang of cutting tool from rail without lost time . . . independent side head permits simultaneous machining with vertical head without interference or lost time between cuts.

For other cost-cutting features of the Bullard 36″ Cut Master Vertical Turret Lathe, write today for Bulletin CVTL 3-10-44, The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE



BULLARD 36″ CUT MASTER VERTICAL TURRET LATHE with swiveling main turret head and non-swiveling side head. 20 table speeds. Built-in 3-jaw combination chuck or 4-jaw independent chuck. Each feed unit has 16 feeds ranging in geometric progression from .0026 to .500 per revolution of work spindle.

This boy tried hard—but he lost.

He was searching for something. In his simple way, he believed he'd find it in the prize fight game. But he didn't seem to have the Big Plan thought out, or something. He lost.

It's that way with people, with organizations, with nations. To survive, we've got to do a lot of thinking. This is a time for it—individually and collectively.

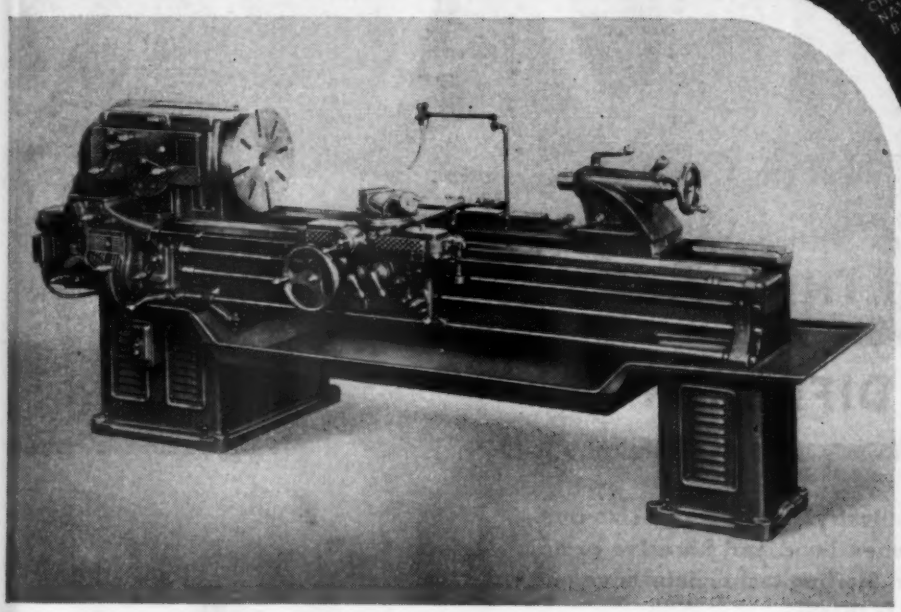
Because this is the Second World War. A Third might reduce all of us, our hopes, our essential rightness, to a pile of ashes. This is a time for straight thinking.

We at Bryant have been trying to see things straight. Some time ago we realized that as essential suppliers to industry we had better have a pretty solid plan. A plan based upon search and research—upon a knowledge of new and better methods of building the needed things of peace—upon service to all comers who might use our specialized knowledge to build a better America. That seemed a good plan, and it has been.

For today, our engineers are working with the engineers, designers and planners of scores of successful American businesses, and many new ones, large and small—helping them to plan now, conversion of their plants, skills and machines to all-out production of new and better products for a prosperous peace.

If you are a manufacturer, we invite you to call us in today.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.



THE SIDNEY TOOL ROOM LATHE

A sturdy lathe designed and built to give utmost in precision work and flexibility to meet the varying demands of tool room operation.

Forty-eight changes of feeds from .0027 to .172 and 49 changes of threads from 1½ to 92, all easily accessible to operator from his normal working position, make it adaptable to an exceptionally wide range of work.

An exclusive Sidney feature, the continuous tooth herringbone geared head assures the required accuracy and the smooth finish desired on tool room work.

Full descriptive bulletin upon request.

SIDNEY

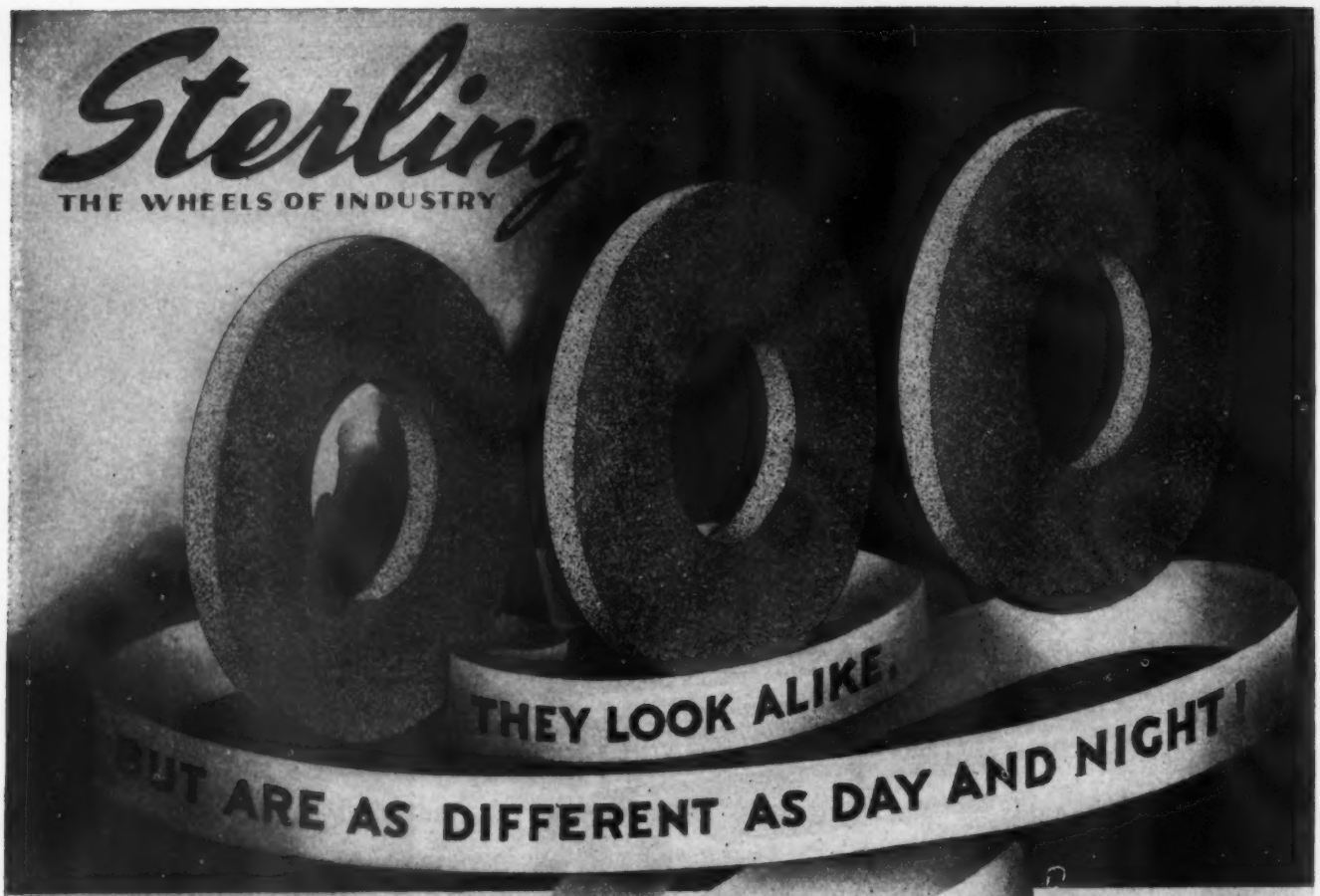
The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

Sterling

THE WHEELS OF INDUSTRY



Many of Sterling's "Wheels of Industry" are alike in size and shape, but are vastly different when bond and abrasive grain are considered. The quality that Sterling technicians have put in these wheels is unseen, but it is there!

Sterling bonds, for example, come in for much study. Bond—the "cement" that holds the abrasive grains together—must be planned according to the demands of each grinding job. If it is a tough piece of work, the bond must release the dulled abrasive grains at the correct instant to expose the new, sharp abrasive. If soft materials are being ground, the bond must retain the grains until the last effective cutting action has been secured.

Your Sterling Grinding Wheels last longer and do better jobs because of the unusual attention we give to producing the correct bond for every wheel. Your grinding jobs are no exceptions —Sterling engineers, skilled by years of experience, can recommend correct bonds that may increase your production at no added cost. Write!

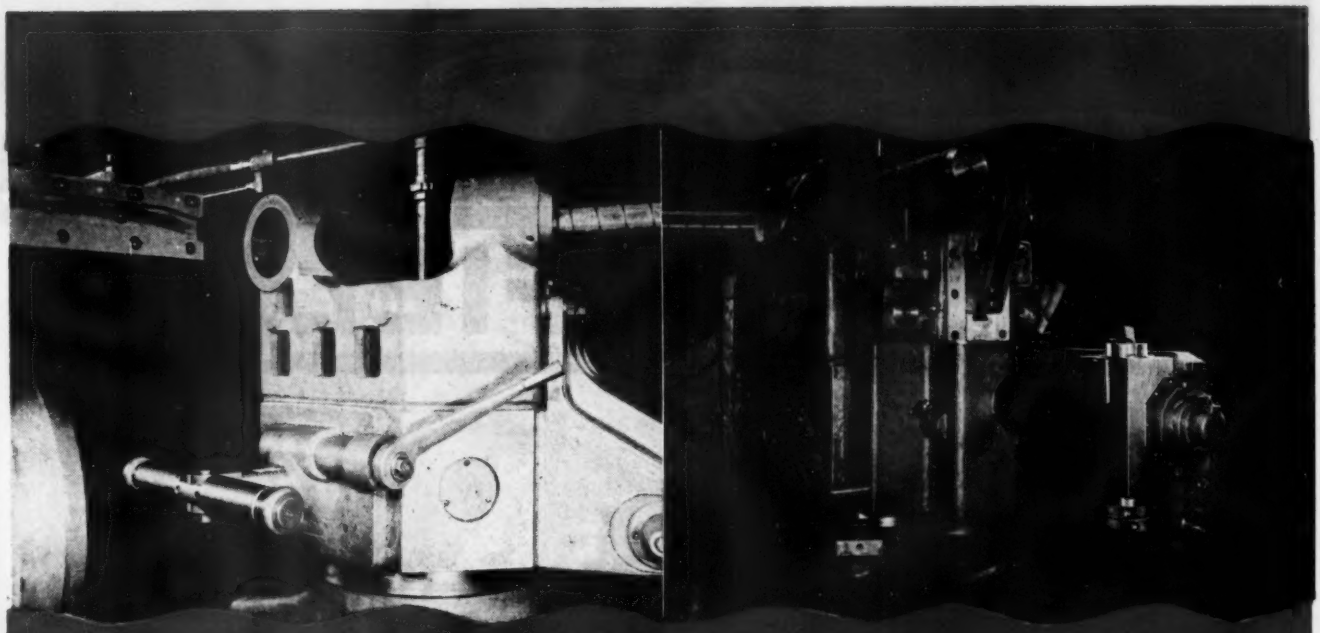
Glass Shatters Upon Impact . . A Good Wheel Bond Does Not!

The shock of wheel impact against the work calls for specially designed Sterling bonds. Unlike common glass which is strong but brittle, Sterling bonds do not shatter prematurely under the shock of grinding action . . . they stand up to the job.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY



P&J has the Re-tooling "KNOW-HOW" to convert present machines to new work....

The tooling set up of the 9 DT POTTER & JOHNSTON Chucking Machine shown here was designed by P & J engineers to handle a specific war production job. This machine (as well as all P & J machines) can be converted to handle other work. Because of wide range tooling possibilities, retooling is practical and economical.

The logical course to follow in re-conversion is to call in the same engineering talent which was responsible for the original tooling and let this specialized "know-how" be applied in re-tooling for new work. After all, P & J engineers have the advantage of accumulated experience on P & J equipment.

If you are planning to use your P & J machines on post-war work, consult P & J engineers immediately and be properly prepared for reconversion.

POTTER & JOHNSTON MACHINE CO., *Pawtucket, R.I.*

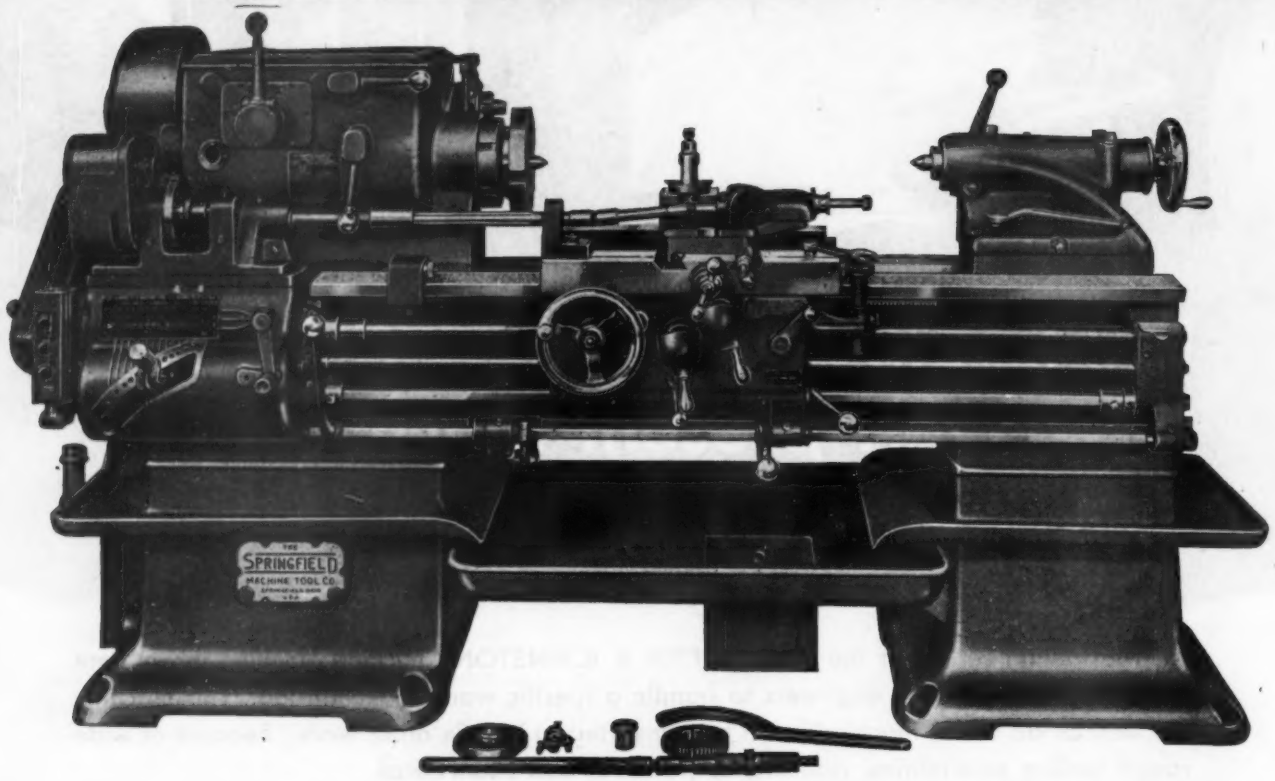
P&J REBUILDING SERVICE

Investigate the rebuilding facilities available in the P & J plant for restoring your P & J equipment to original accuracy and performance. You can also re-tool conveniently at the time of rebuilding.

Fight the good fight . . . with BONDS

Choose

SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

PRELUBRICATED SEALED BALL BEARINGS...NOW STANDARD ON TYPE CSP MOTORS UP TO 3 HP

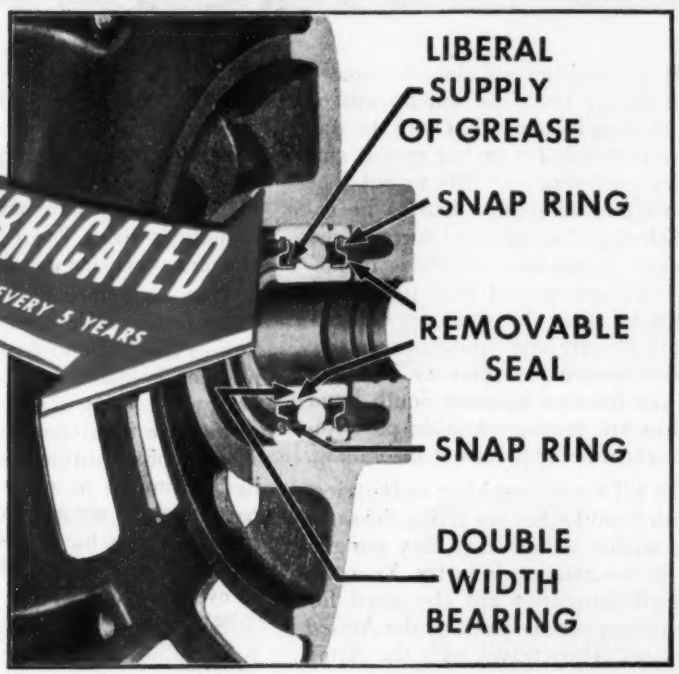
Bought now, Westinghouse Type CSP Prelubricated Motors need no greasing till 1950! Extensively field tested in thousands of textile motor applications, the prelubricated ball bearings in Westinghouse Type CSP general-purpose motors have proved they can operate five years . . . 24 hours a day . . . without greasing. Overgreasing and consequent grease seepage into windings is eliminated. One of the major items of induction motor maintenance, periodic greasing, has been reduced to one grease packing job in five years.

Every Westinghouse Type CSP Motor up to 3 hp carries the "Prelubricated" label. For complete information on how the Type CSP Motor can reduce your maintenance, write for D.B. 3100-CSP. Westinghouse Electric & Manufacturing Co., P.O. Box 868, Pittsburgh 30, Pa.

J-21317

FORGET LUBRICATION...

till 1950!



ADVANTAGES OF WESTINGHOUSE TYPE CSP PRELUBRICATED MOTORS

- **Prelubricated Sealed Ball Bearings** reduce lubrication maintenance . . . assure longer grease life
- **Improved Tufferneil Insulation**
- **Dynamically Balanced Rotor**
- **Die-cast Rotor** with oversize fan
- **Liberal Through-ventilation**—air enters front, leaves at drive end of motor

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Type CSP Motors

Setting Performance Records for Precision Machining

South Bend Precision Turret Lathe in the Factory of the Republic Aviation Corporation

High precision and close tolerances have always been the watchwords of the aviation industry. But with the war came demands for higher speeds and better performance. This meant that even closer tolerances had to be established and maintained through the greatest production schedules in history. We are proud that providing lathes to meet the exacting requirements of warplane production is one of our important assignments. Throughout the aviation industry South Bend Lathes are setting enviable performance records for precision machining.

In all metal working industries, South Bend Lathes are giving the same dependable service that they are giving in the aviation industry. Versatile and efficient, they are also used for emergency service work by the Armed Services. They travel with the Army in compact mobile machine shops. Many fighting ships of the Navy have one or more South Bend Lathes on board for making emergency repairs at sea. They are used by the Air Forces in repair bases here and overseas—sometimes even flown by plane for emergency service in remote locations.

Now, as before Pearl Harbor, our entire factory is devoted to the production of South Bend Lathes. No other product is made by us. There has been no lowering of standards because of wartime restrictions and shortages. The use of substitute materials is negligible, limited to a few non-essential parts such as name plates, paint, etc. Improvements have been accelerated. Today, South Bend Lathes are better in every way.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 with 10″ swing and 1″ collet capacity.

NEW CATALOG NOW READY!

Write For It!

Illustrated in full color—this new 64-page catalog shows all types of South Bend Lathes. Also shows complete line of accessories and attachments for use with these lathes. *Ask for Catalog No. 100-D.*

Lathe Builders For 38 Years

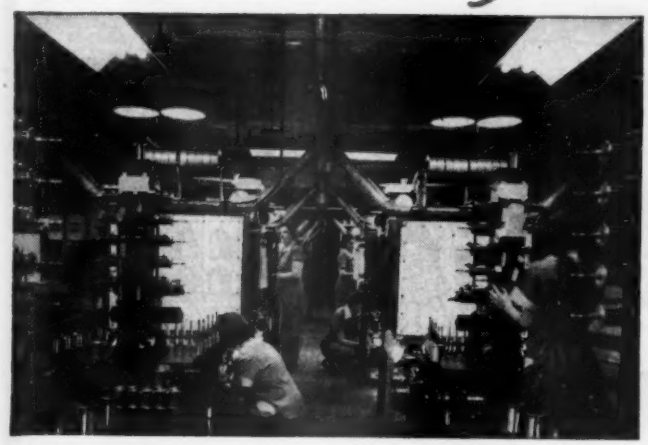
SOUTH BEND LATHE WORKS

419 East Madison Street • SOUTH BEND 22, INDIANA

4 TOUGH JOBS

. . . and how to lick 'em with G-E Mazda Lamps

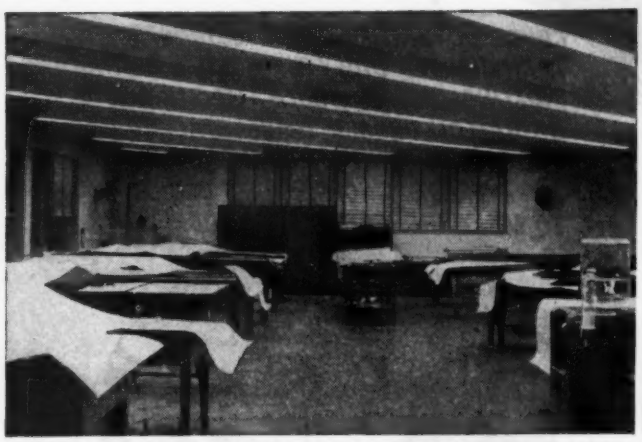
Proper use of better lighting can produce startling results . . . in better efficiency, in reduced spoilage, in more and faster production. Shown here are four typical industrial jobs, each much improved with better lighting from G-E Mazda Lamps. Ask your G-E Lamp Distributor for full details.



1 **Instant detection** of breaks in fine wire helps this plant keep production up, costs down. Correct lighting with G-E Mazda Lamps enables even unskilled workers to reduce errors and do more accurate work.

2 **Polished surfaces** often present tough inspection problems. Above, inspection of highly polished machine parts is made easier with low brightness, high footcandle lighting developed with G-E Mazda Lamps.

3 **Safety hazards** can be minimized with high level illumination. G-E Mazda Lamps provide uniform, efficient light sources to help operators see better, faster, more accurately.



4 **Fewer mistakes!** G-E Fluorescent lighting helps to hold shadows at an absolute minimum. It approaches actual daylight conditions with soft, cool, low-brightness illumination.

"To make G-E Lamps STAY BRIGHTER LONGER"
The constant aim of G-E Lamp Research

G-E MAZDA LAMPS

GENERAL ELECTRIC

Hear the G-E radio programs: "The G-E All-Girl Orchestra", Sunday 10:00 p. m. EWT, NBC; "The World Today" news, Monday through Friday 6:45 p. m. EWT, CBS; "The G-E Houseparty," Monday through Friday 4:00 p. m. EWT, CBS.

BUY MORE WAR BONDS . . . AND HOLD 'EM

Do you know that . . .

AMERICAN AIRLINES INC. UNDER CONTRACT TO THE AIR TRANSPORT COMMAND HAS MADE MORE THAN 4300 TRANSATLANTIC CROSSINGS . . . FOR LUBRICATION OF ITS GREAT FLAGSHIP FLEET, AMERICAN USES SINCLAIR PENNSYLVANIA MOTOR OIL.

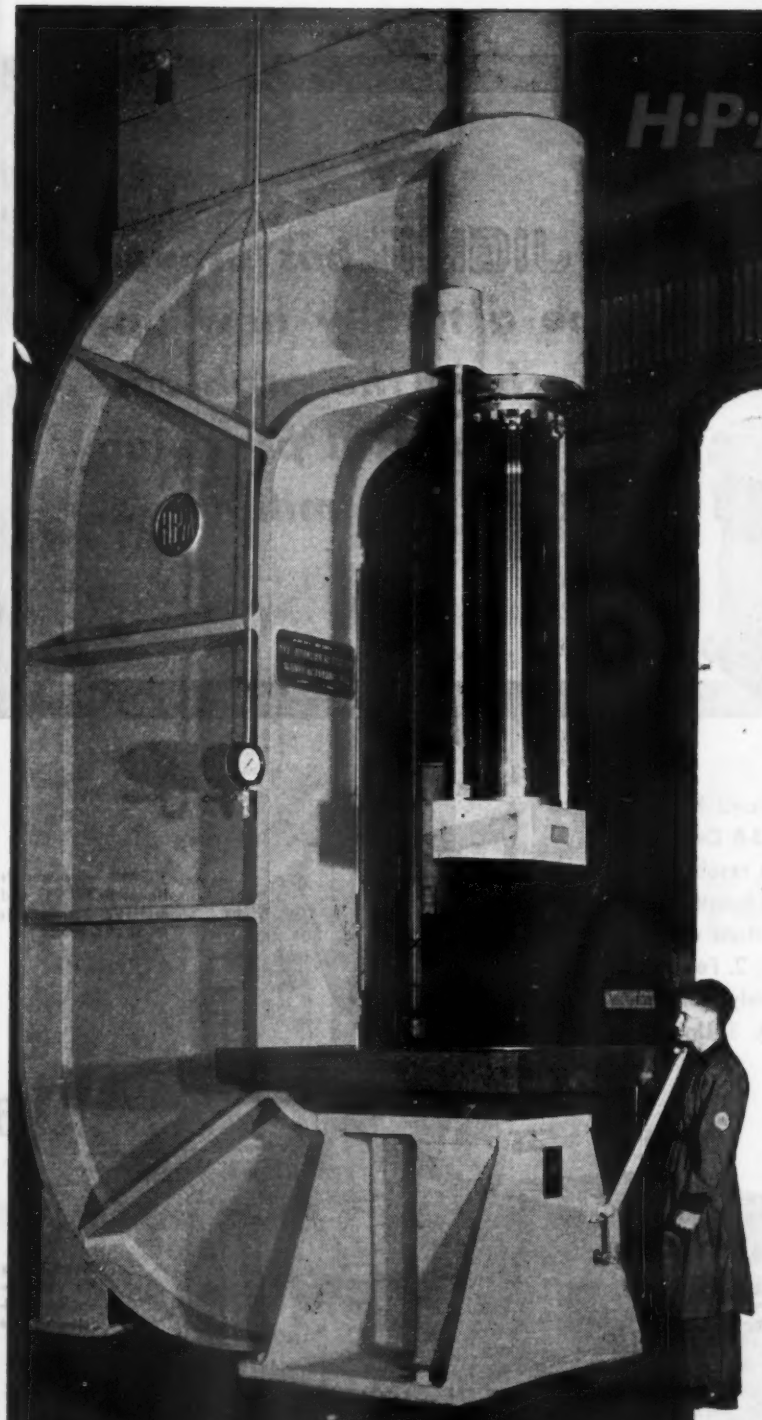
CRUDE OIL AND FINISHED PRODUCTS TRANSPORTED DAILY THROUGH THE SINCLAIR PIPELINE SYSTEM WOULD FILL 318,400 55-GALLON DRUMS. THESE, STACKED END ON END WOULD BE 31 TIMES HIGHER THAN MT. EVEREST. SINCLAIR USES OLDEST CRUDES TO MAKE HIGHEST QUALITY LUBRICANTS.

FOR FASTER MACHINING, FINER FINISH, AND LOWEST COST PER UNIT MACHINED SINCLAIR PROVIDES DIVERSIFIED CUTTING OILS SUITED TO ALL TYPES OF METALS . . . ALSO SPECIALIZED LUBRICANTS FOR BETTER MAINTENANCE OF EQUIPMENT.

SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

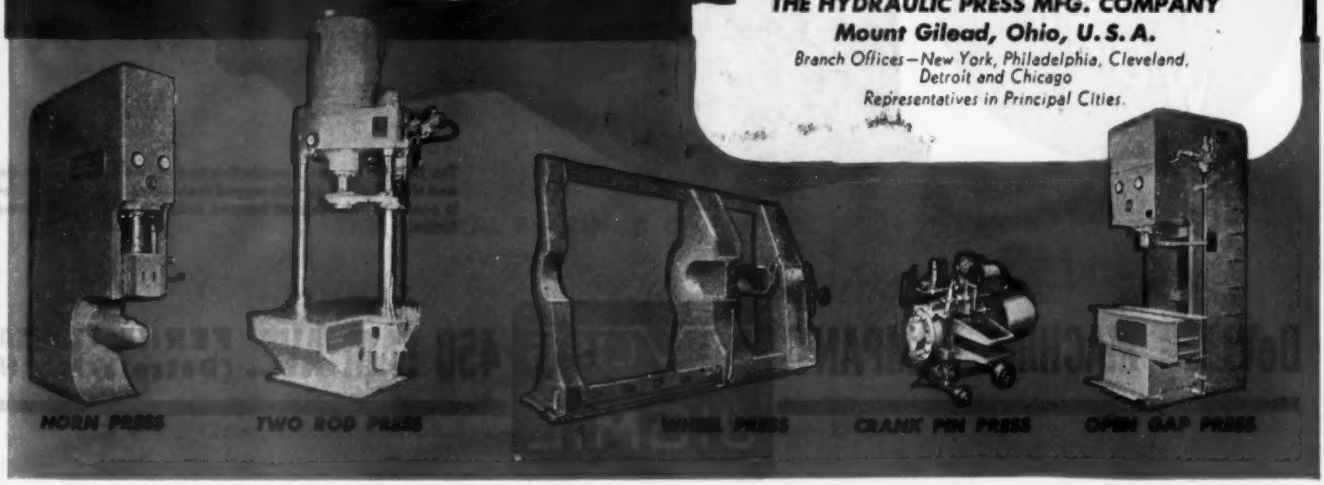
H-P-M All-Hydraulic FORCING PRESSES



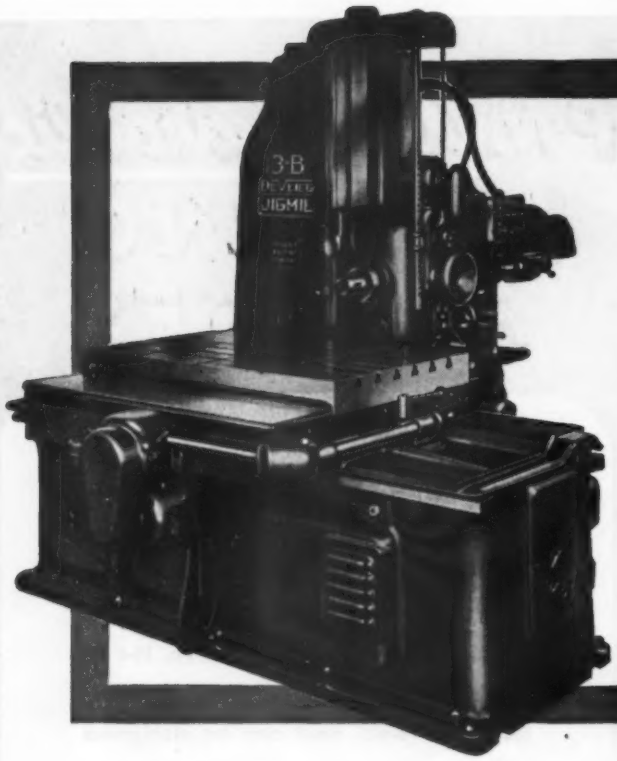
H-P-M All-Hydraulic forcing presses are used extensively for assembling, punching, forming, straightening and other general forcing operations requiring a high unit pressure. H-P-M forcing presses also serve as production line tools, and can be designed with speed and pressure capacities to meet mass production requirements. Each press is completely self-contained, being powered by the reliable H-P-M oil-hydraulic operating system. Each press is designed and built specifically to meet your pressure processing needs. Undoubtedly there is a size and style already engineered which will meet your requirements, thus saving you both time and cost of engineering. Write today, stating your requirements.

HPM

THE HYDRAULIC PRESS MFG. COMPANY
Mount Gilead, Ohio, U. S. A.
Branch Offices—New York, Philadelphia, Cleveland, Detroit and Chicago
Representatives in Principal Cities.



HORN PRESS TWO ROD PRESS WHEEL PRESS CRANK PIN PRESS OPEN GAP PRESS



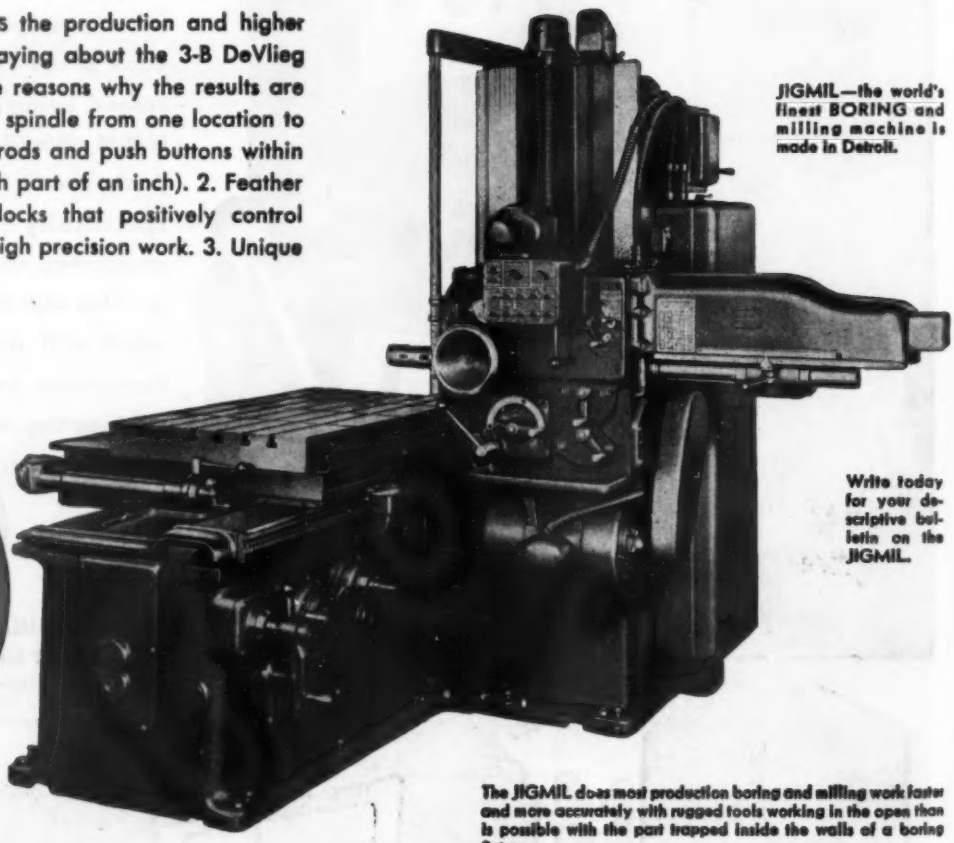
★

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling . . .

★

"TWO TO THREE TIMES the production and higher quality work" is what users are saying about the 3-B DeVlieg JIGMIL—and here are some of the reasons why the results are better: 1. Automatic positioning of spindle from one location to another in response to measuring rods and push buttons within less than .0001 (one ten thousandth part of an inch). 2. Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work. 3. Unique operation and controls that make possible high precision work with relatively little skill.

JIGMIL—the world's finest BORING and milling machine is made in Detroit.

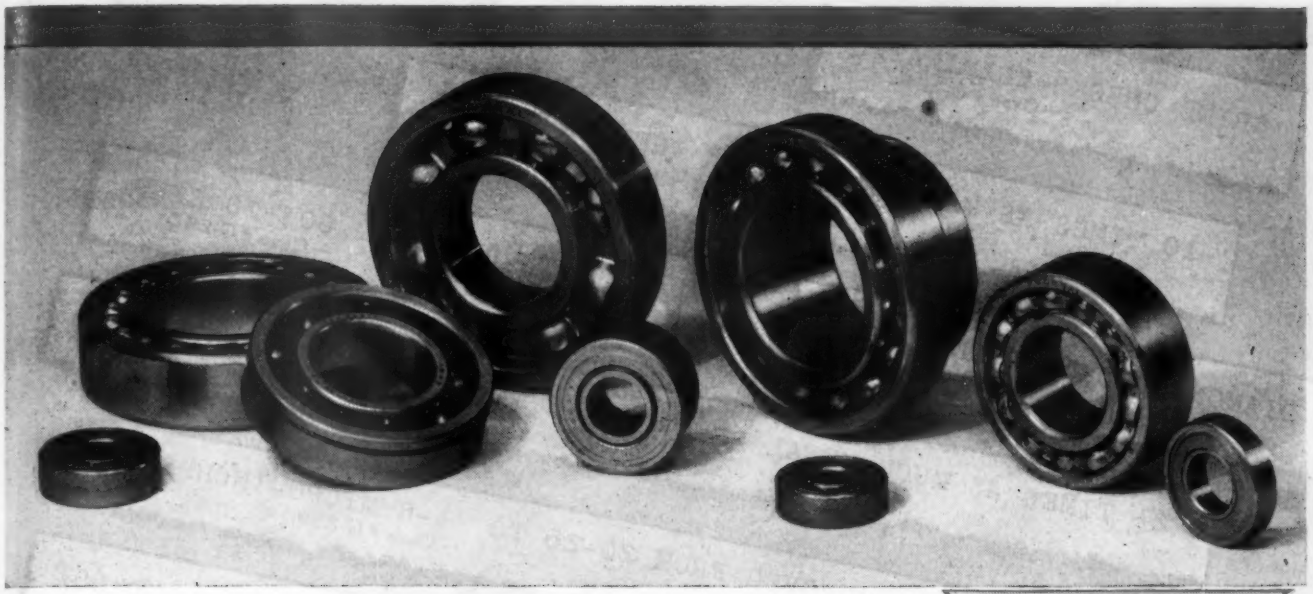


JIGMIL YOUR WORK

Write today for your descriptive bulletin on the JIGMIL.

The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



Complete BALL BEARING Coverage

WITH

FEDERAL

THE FEDERAL LINE IS COMPREHENSIVE AND COMPLETE . . . IT INCLUDES HIGHLY PRECISION AND OTHER TYPES OF FINE BALL BEARINGS FAMOUS FOR QUALITY, STRENGTH AND ENDURANCE.

SINGLE ROW
CONRAD
MAXIMUM
SEALED
SNAP RING
RAD. THRUST
INCH TYPE

DOUBLE ROW
RADIAL
RAD. THRUST
SELF-ALIGNING
SHIELDED

SEALED
OR
SHIELDED
FELT
OIL
VACUUM
SINGLE
AND
DOUBLE ROW

WIDE INNER
SINGLE ROW
DOUBLE ROW
SELF-ALIGNING
WITH
SET SCREW
OR
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THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

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REPRESENTATIVES LOCATED AT

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GRIND CHECKS ELIMINATED
—Case #G-261

10 TIMES AS MANY PIECES PER WHEEL DRESSING
—Case #G-259

REJECTS CUT FROM 60% TO ZERO
—Case #G-252

DIAMOND COST CUT ONE-THIRD
—Case #G-260

2½ TIMES AS MUCH METAL REMOVED PER MINUTE—WITHOUT BURNING
—Case #G-271

FINISH IMPROVED FROM 20-25 TO 2½-6 MICRO-INCHES
—Case #G-259

POWER CONSUMPTION CUT 50%
—Case #G-251

WHEEL LIFE PRACTICALLY DOUBLED
—Case #G-253

GRINDING TIME CUT FROM 15 MINUTES TO 5 MINUTES
—Case #G-271

PRODUCTION PER HOUR UP 40%
—Case #G-261

QUAKER MICROGRIND PROCESS

May we send you complete details on each of these actual production grinding operations? Just use the handy reply form provided below. Results like these are being enjoyed regularly in many leading plants employing this truly revolutionary grinding process. On request, a Quaker Process Engineer will be pleased to call and apply the QUAKER MICROGRIND PROCESS on the toughest grinding job in your shop and explain the radically different principles involved.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

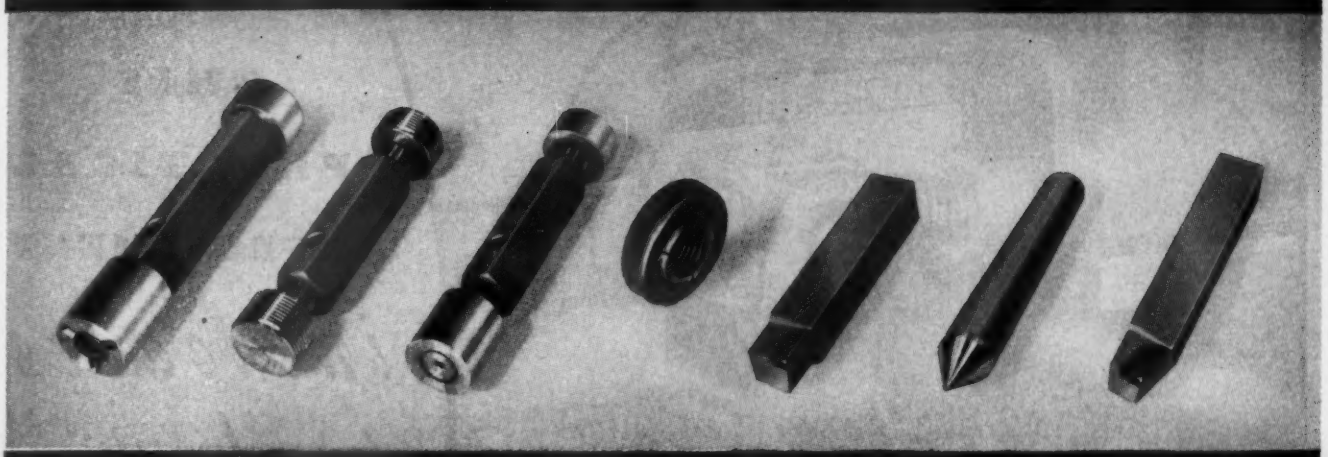
Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••

Standard or special!



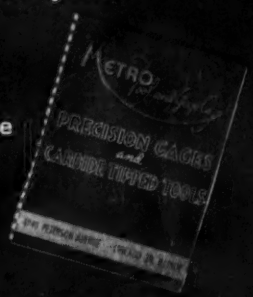
METRO

GAGES – CARBIDE TIPPED TOOLS

Metro Standard Tools and Gages are doing a grand job in all types of production—because they're made by men who know how to make tools for men who know how to use them.

Maybe a *special* tool or gage would save you money on your operations. Ask us to design or make it up for you.

Standard Gages and Carbide Tipped Tools are available through your Metro distributor.

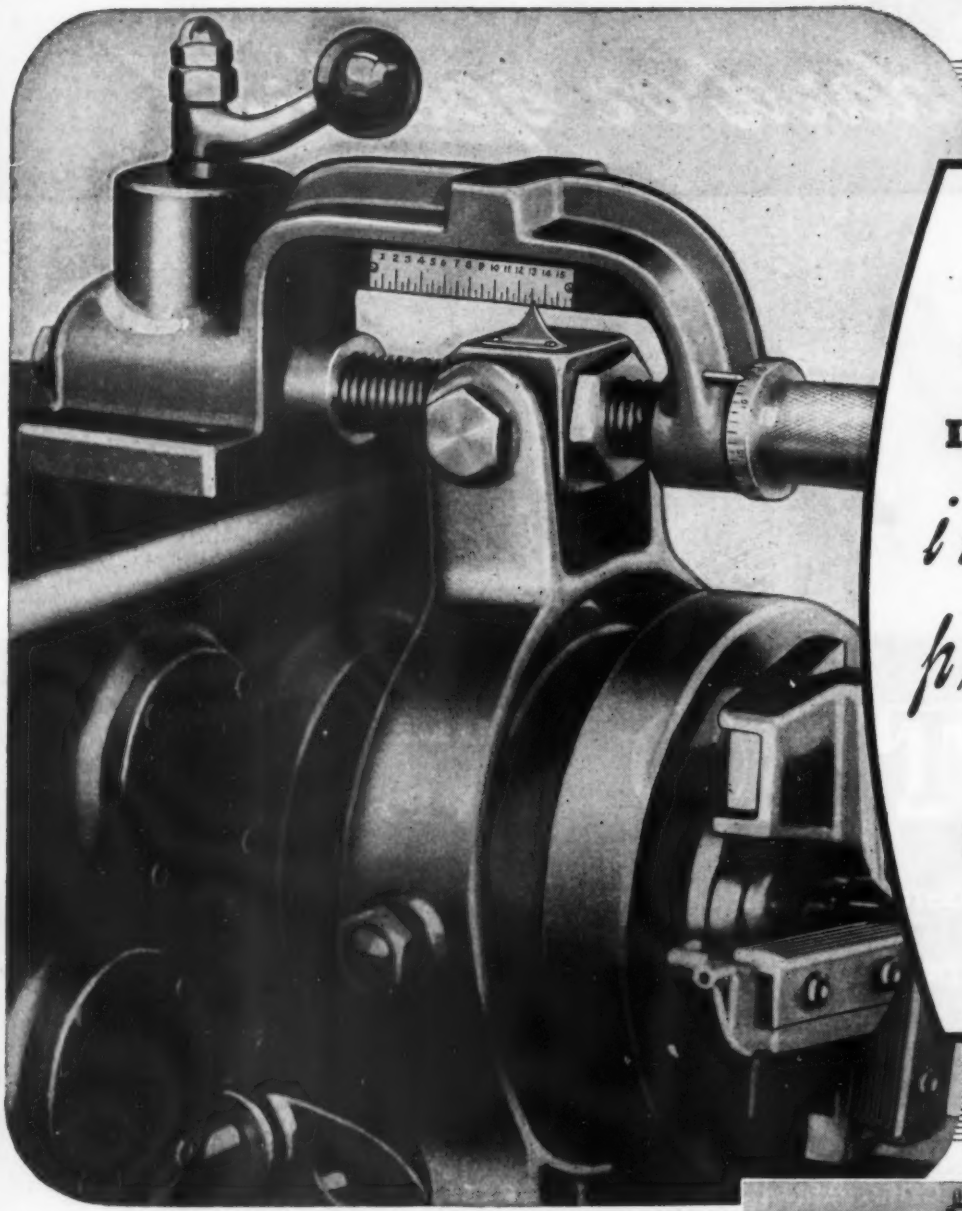


Write for Catalog No. 102

METRO

TOOL AND GAGE CO.

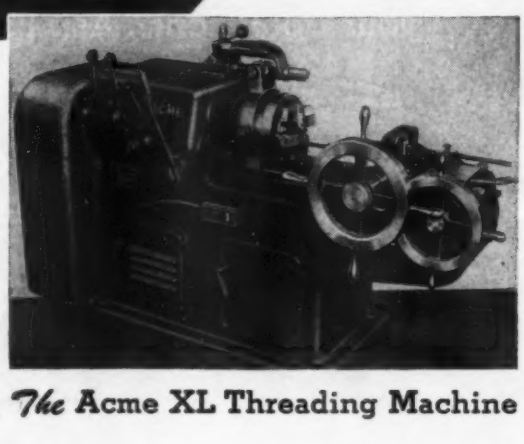
4240 Peterson Avenue
Chicago 30, Illinois



THIS PRACTICAL IMPROVEMENT *increases production* ON MULTIPLE CUT THREADING

By simply moving the ball handled lever on top of the Acme XL Threading Machine, the depth of cut is automatically determined and registered on the graduated rule without stopping rotation of head. One or more roughing cuts can be taken with the assurance that the final finishing cut will be accurate according to the setting on the calibrated dial of the Acme XL micrometer adjustment. Here is a practical improvement that will increase production on coarse pitch threading.

Acme XL Threading Machines are built in single spindle from 1" to 3" inclusive; double from 1" to 2½" inclusive. For more information, write today for bulletin XL-3.



The Acme XL Threading Machine

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

FORGING · THREADING · TAPPING · BOLT · NUT · RIVET MACHINES • ALSO MANUFACTURERS OF HILL HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES

Swift and Sure!

A grinding wheel that cuts cool at high rates of speed, producing amazingly fine tolerances, is only one of the many outstanding products of the Mid-West Abrasive Company.

Engineered quality is built into each of the many items in the broad Mid-West line of classifications—honing and sharpening stones, sandpapers, rubbing bricks, abrasive specialties or wheel dressers.

Let one of the Mid-West staff of experienced field engineers survey your abrasive needs and recommend the items to meet them.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • 1960 E. Milwaukee, Detroit 11, Mich. • Rochester, Pa.

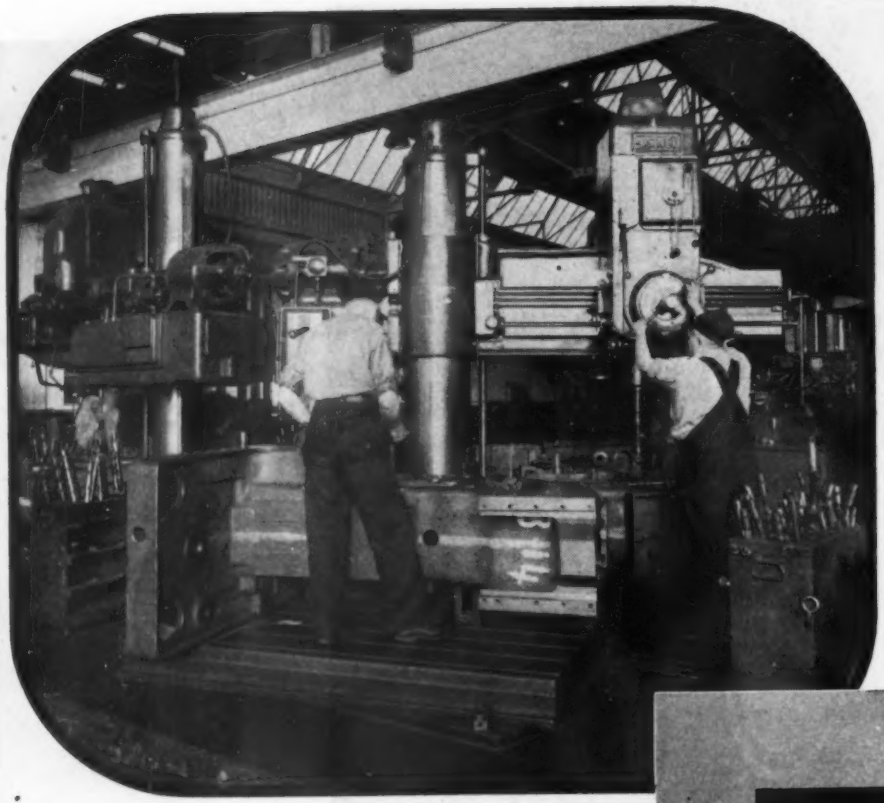
MAIL COUPON FOR FREE POCKET HONE

Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Michigan

Please send me your complete data book on grinding wheels.

NAME_____

ADDRESS_____



● The use of two bases with this Fosdick Radial permit drilling and tapping operations on two sides of the work so that production is practically continuous.

Here's how it's done. While one operator sets up the work and locates jigs in operating position the Radial operator drills and taps holes on one side of casting. The head is then swung over the other casting for drilling and tapping the other side of the work. The completed work is removed and another casting is set up in its place. By this time the work on the other base is completed and the operation of setting up is duplicated. Thus operation is practically continuous and production has been increased about 100%.

This is typical of the versatility of Fosdick Radials. Let us show you how Fosdick Radials can serve you better—increase production—cut costs. *Fosdick Radial Bulletin RA gives complete details. Write for one.*

TWIN BASES ON

FOSDICK RADIAL

Provide for practically 100% increase in production

ARMY (E) NAVY

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

Speed of machine: **DOUBLED**

Running time between wheel dressings: **80% LONGER**

Production per machine: **62% GREATER**

AND HERE'S WHAT DID IT

And here's why you can expect not only a big jump in production . . . but finer finish as well . . . when you switch to 873 Marathon C-6 in your thread grinding operations:

Anti-stain, Anti-foam. Without sacrifice of coolant or lubricating superiority, 873 Marathon C-6 has marked anti-stain, anti-foam characteristics.

No smoke. 873 Marathon C-6 operates at lower working temperatures, promotes greater accuracy and longer wheel life. There's no smoke, no thread burning.

Transparent. Operators can read a scale through 873 Marathon C-6, make on-the-job adjustments. No fog . . . and it stays clear, does not sludge in use.

Write, phone, or wire. *Ask an Ohio Oil lubrication engineer to call, discuss your problems, specify Marathon cutting and grinding oils that get jobs through faster.*

The OHIO OIL COMPANY

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

A Complete Line of Cutting and Grinding Oils for Every Metal Working Operation.

MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

Cincinnati Hypro

7′ VERTICAL BORING MILL

With the New Cincinnati Speed Control

The new Cincinnati Speed Control Boring and Turning Mill has finger-tip speed adjustment at the pendant station.

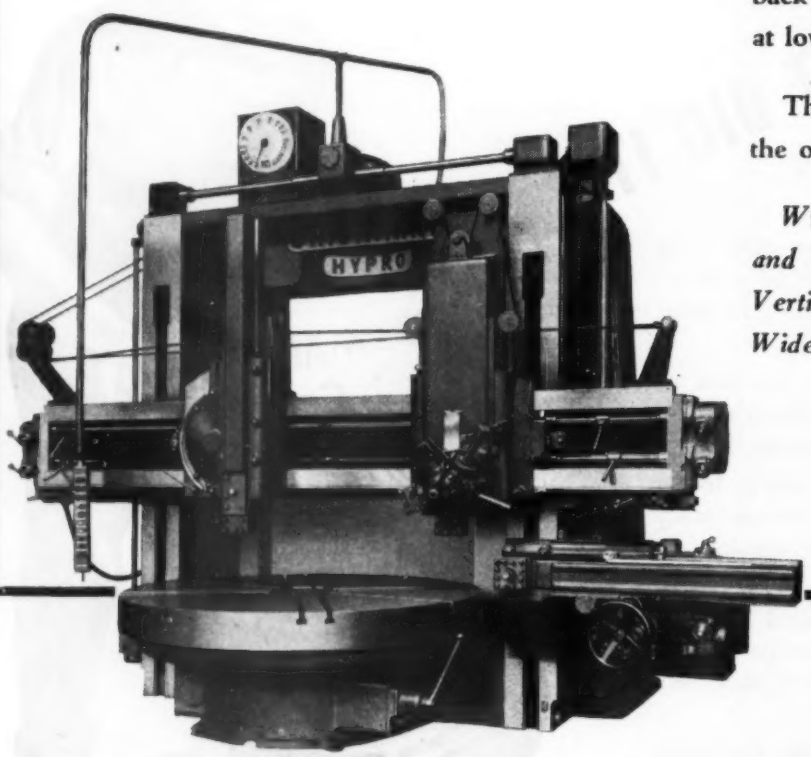
It is no longer necessary to shift gears to change the speed.

A complete range of table speeds under ordinary cutting loads may be handled by push button control.

This can be done without gear shifting or stopping the table. A back gear meets heavy cutting needs at low speeds.

The large graduated dial gives the operator table speeds instantly.

Write for Bulletin 132 describing and illustrating Cincinnati Hypro Vertical Boring Mills 54″ to 7′ Widened to 8′ Sizes.

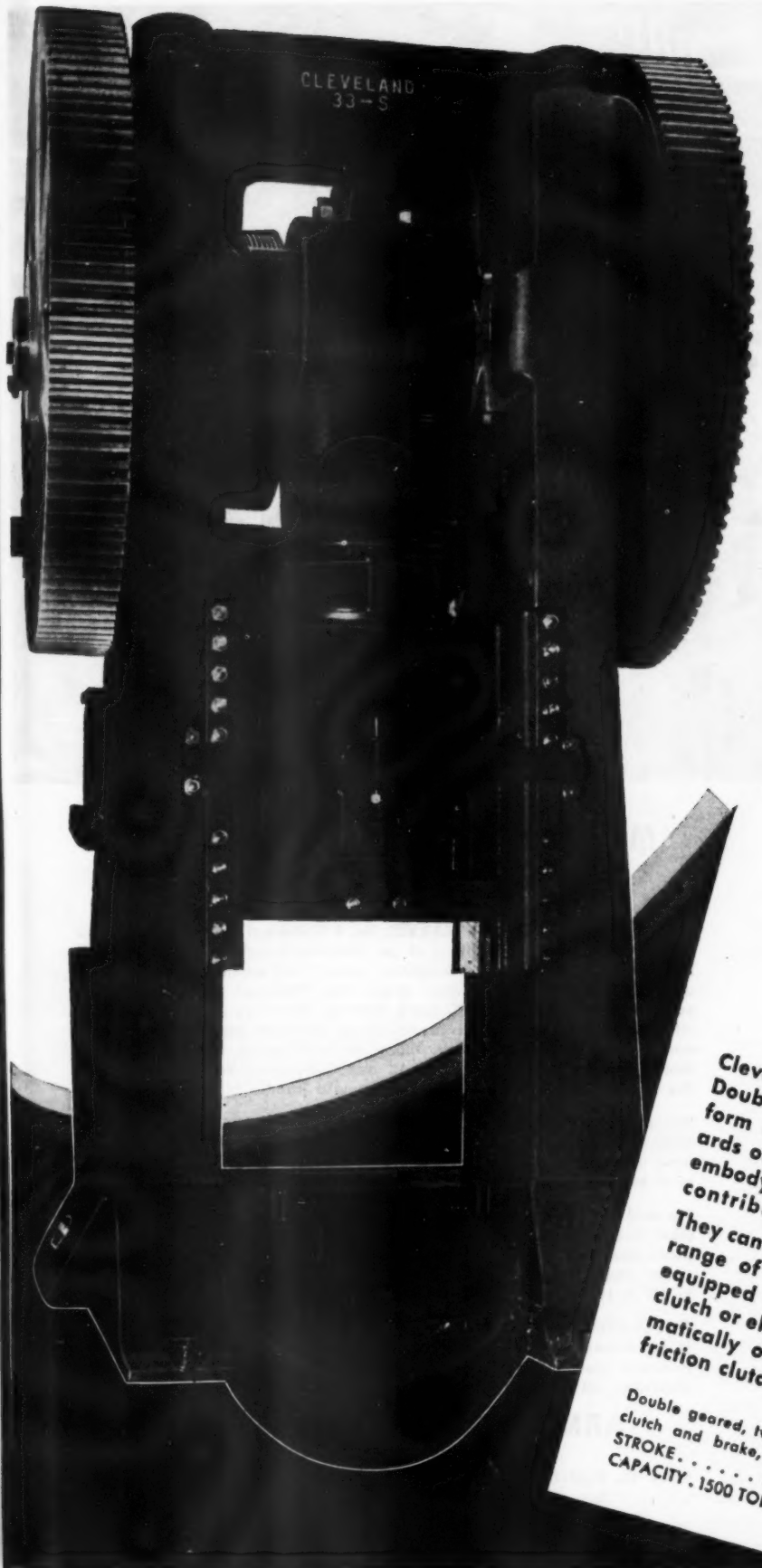


MAKE YOUR RED CROSS GIFT AS BIG AS YOUR HEART

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.



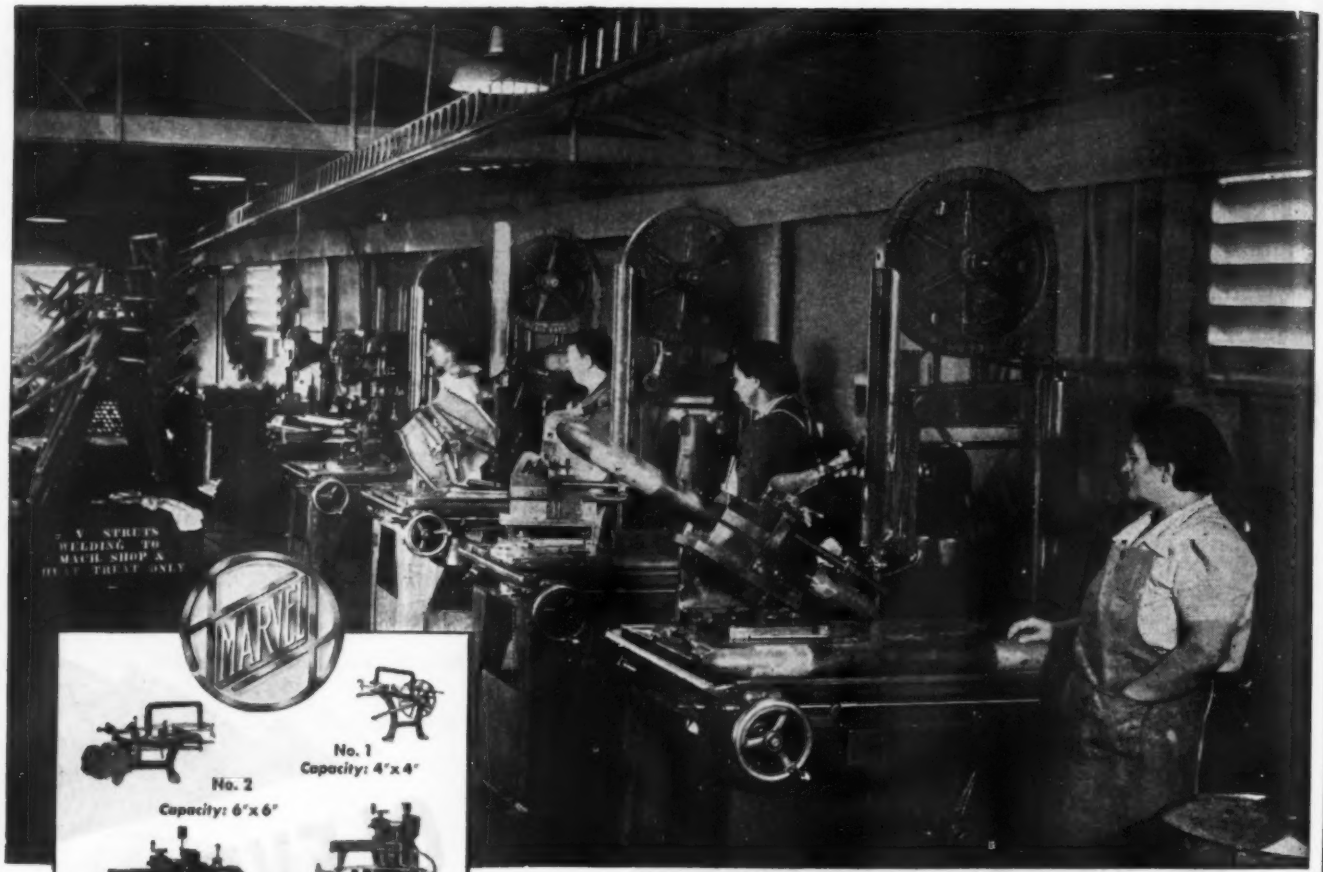
CLEVELAND Straight Sided Single Crank PRESS

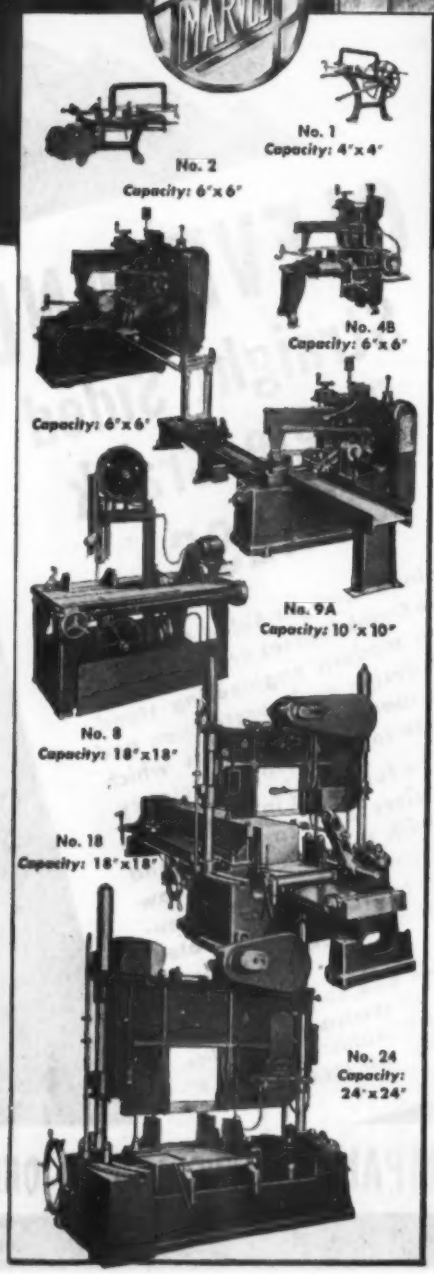
Cleveland Straight Sided Single and Double Crank Presses are built to conform to modern engineering standards of design and construction and embody many improvements which contribute to operating efficiency. They can be furnished in a very wide range of sizes and capacities and equipped with treadle operated jaw clutch or electrically controlled pneumatically or hydraulically operated friction clutch and brake, as desired.

•

Double geared, twin drive, air operated friction clutch and brake, air counterbalance to slide.
STROKE . . . . . 14" ADJUSTMENT . . . 8"
CAPACITY . 1500 TONS BED AREA . . 56"x 56"

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY • CLEVELAND 14, OHIO





MAKE ANGULAR CUTS ON AWKWARD WELDMENTS EASILY

Illustrated are six of the 13 MARVEL No. 8 Universal Metal Cutting Band Sawing Machines in the plant of the National Supply Company in Torrance, California. They are operated entirely by women, cutting tubing at various angles for airplane struts. The National Supply Company selected the No. 8 MARVEL Band Sawing Machines for this work because no other equipment is available to cut these airplane struts with ease, accuracy and economy. They are also using this saw in their tool room, for no matter how small and delicate or heavy and clumsy the job, the MARVEL No. 8 Band Saw will handle it with equal ease.

For production cutting of bar stock up to 10" x 10", they are using three No. 9A MARVEL Saws; which automatically measure, cut and feed up bars up to 10" diameter into accurate, equal lengths, similar to a screw machine, without the attention of an operator.

For real big sawing work, such as shipshaft, breech blocks of guns and other heavy forgings, three No. 18 MARVEL Universal Roll Stroke Hack Saws are used. These giant saws have made possible the economy, speed and efficiency of the Hack Saw Method on cutting large work up to 18" x 18" and 24" x 24".

A "MARVEL metal cutting specialist" is available to survey your work, to recommend the best solution to your cut-off problem and to furnish accurate cost and production data on your work. All without cost or obligation, of course. Write for full information.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

This 30-year-old control system (top) was replaced by the flexible Westinghouse Mot-O-Trol drive (center) which eliminated vibration, cut setup time, improved precision, and saved 35% in floor space (bottom).

Here is a prize example of the smooth regulation Westinghouse Mot-O-Trol offers for modern electronic control on countless tasks.

This grinding operation required closely regulated speeds over a wide range in machining hardened pump liners. But the cumbersome overhead controls of these 30-year-old grinders were unable to meet these demands. Excessive vibration ground chatter marks into the liners. Subsequent honing became inaccurate. Setup time was high.

The answer was found in replacing the obsolete controls with Westinghouse Mot-O-Trol, an electronic drive combining an electronic rectifier (to change a-c to d-c) and a d-c driving motor with stepless speed controlled by a potentiometer in the pushbutton station.

The grinding operation showed immediate improvement. Vibration and chatter marks were eliminated. Precision was sharply improved; setup time was cut. And the new arrangement saved 35% in floor space.

This case history is typical of the flexibility of Mot-O-Trol in solving any control problem requiring wide-range stepless speeds and close, automatic regulation at all speeds and at varying loads. Your nearest Westinghouse office has all the information in Bulletin B-3301. Or write Westinghouse Electric & Manufacturing Company, P. O. Box, 868, Pittsburgh 30, Pa.

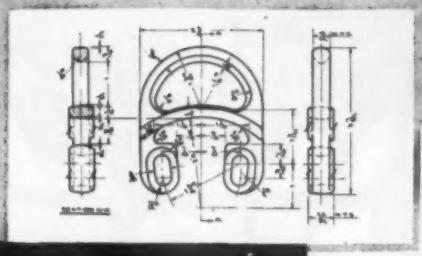
J-60567

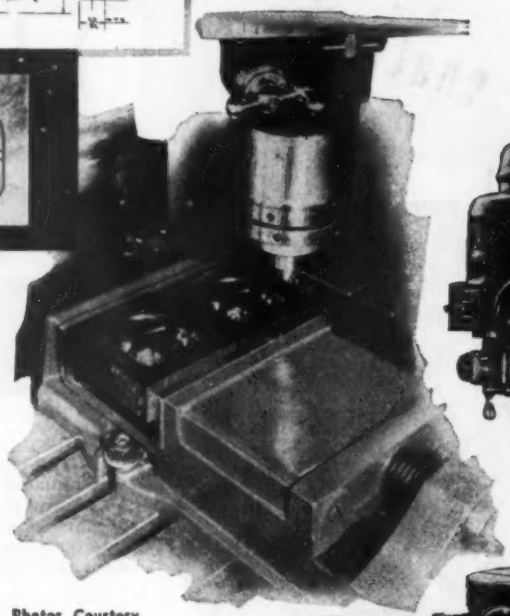
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

Can you Complete this Brass Die-Casting Die in 22 hours?





Photos Courtesy
McGill Mfg. Co.
Valparaiso, Ind.

Both halves of this high chrome steel die were worked together with all layout, milling and drilling operations being completed in one set-up. The Milwaukee Rotary Head Milling Machine completed the job in 22 hours.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold and die cavities in a single set-up without the aid of templets or models.

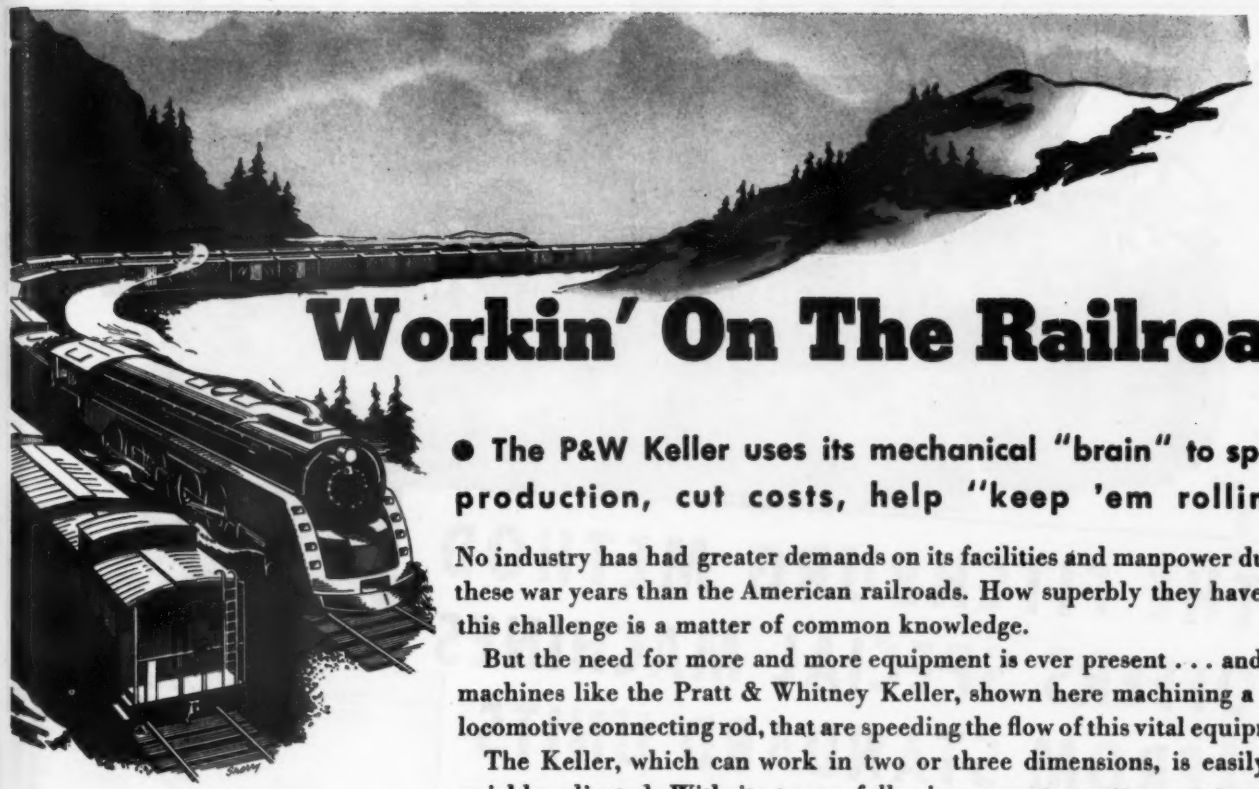
ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C for full information on this unusual machine tool and the Rotary Head method of milling.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

Kearney & Trecker
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation



Workin' On The Railroad

● The P&W Keller uses its mechanical "brain" to speed production, cut costs, help "keep 'em rolling"

No industry has had greater demands on its facilities and manpower during these war years than the American railroads. How superbly they have met this challenge is a matter of common knowledge.

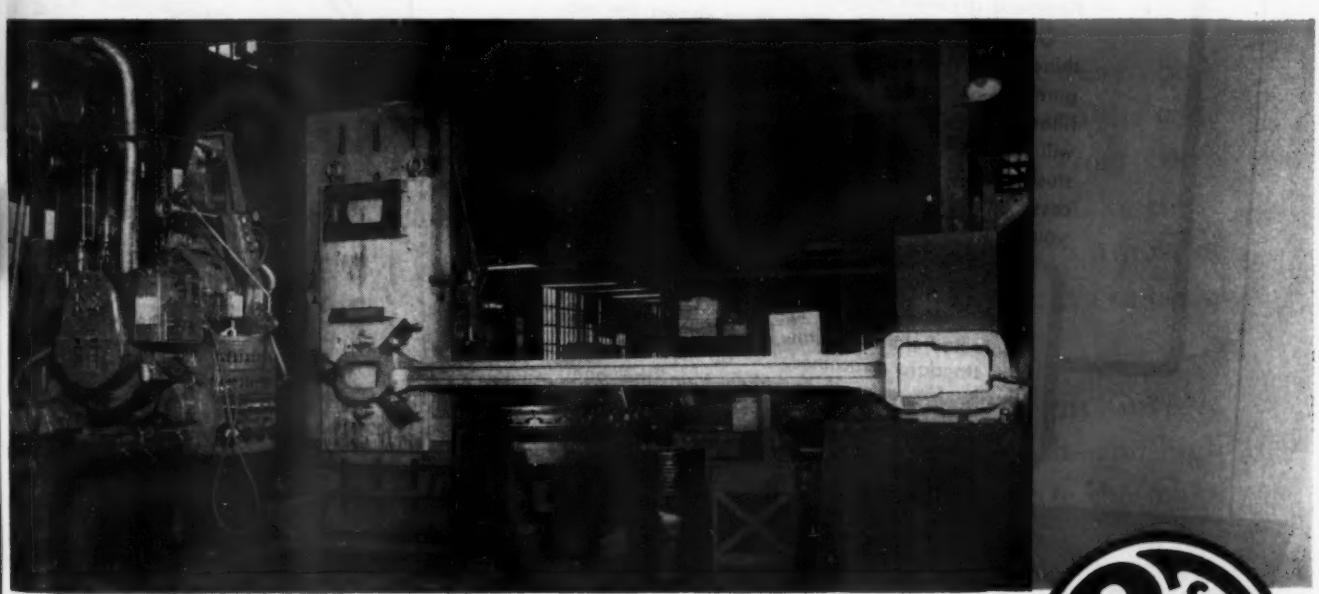
But the need for more and more equipment is ever present . . . and it is machines like the Pratt & Whitney Keller, shown here machining a huge locomotive connecting rod, that are speeding the flow of this vital equipment.

The Keller, which can work in two or three dimensions, is easily and quickly adjusted. With its tracer following a master pattern or template, its cutter carves out the identical contour in metal. Once started, it operates by itself . . . does its own "thinking" . . . maintains its own accuracy.

Also doing 24-hour duty for the railroads are the many Pratt & Whitney Railroad Gages . . . the P&W Railroad Small Tools and Machine Tools. All of these are in great demand because of their extreme accuracy and dependability under all conditions.

Write for full information on the P&W Keller Machine.

● Typical job for the P&W Keller is the machining of the cavities in each end of this locomotive connecting rod. Note the simple and inexpensive template which controls the shape of the cavity. A similar operation is performed quickly and accurately at the other end with the rod reversed. Result: a tremendous saving over conventional methods.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

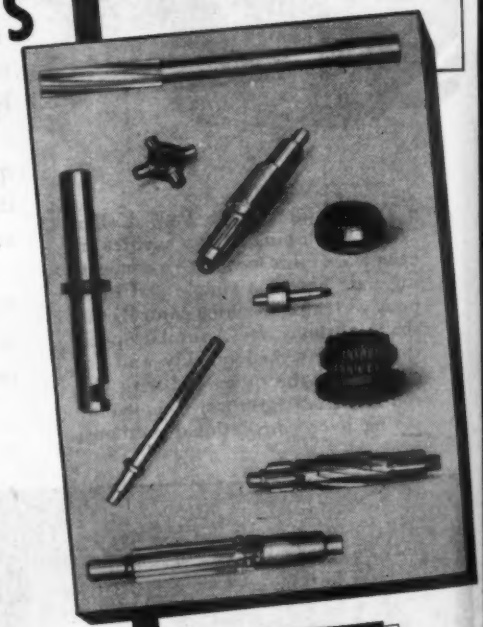
THE FITCHBURG METHOD OFFERS SPECIAL MACHINES FROM STANDARD UNITS

Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.



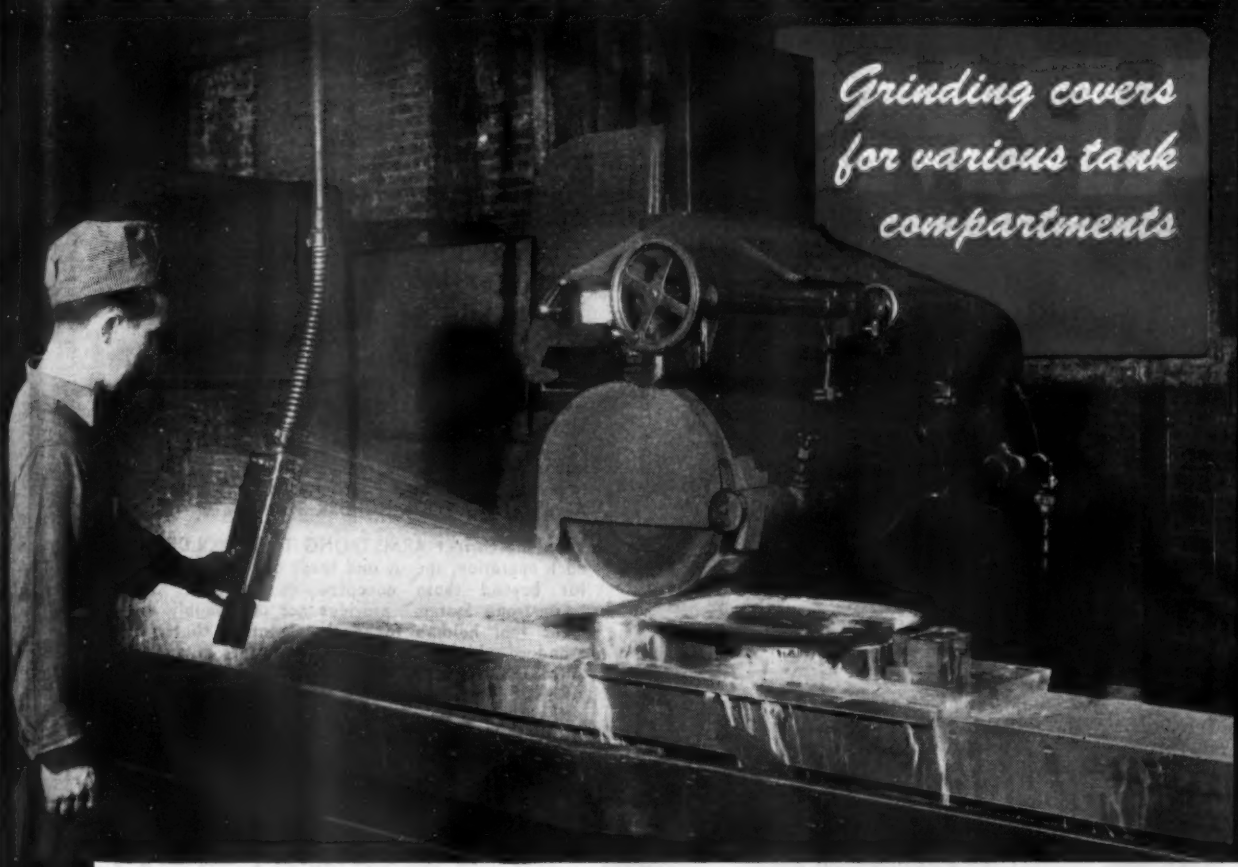
This book shows how to cut grinding costs... Sent free... write for it today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THOMPSON GRINDER



● In the rush for heavy equipment Thompson Grinders are producing in-numerable parts faster—to closer tolerances—at lower costs to help meet the present emergency.

A wide range of covers for various compartments of tanks are being ground on the Thompson Grinder shown. On some of these the fit tolerances are closer than others.

The smooth flow of power to both table and wheel head and the wide range of table speeds from 10 to 100 feet per minute make these machines adaptable to a host of grinding jobs and insure a smooth, accurate grind.

Where the requirements involve precision—smooth finish—and high production investigate the many advantages of Thompson Hydraulic Grinders. Catalog upon request.

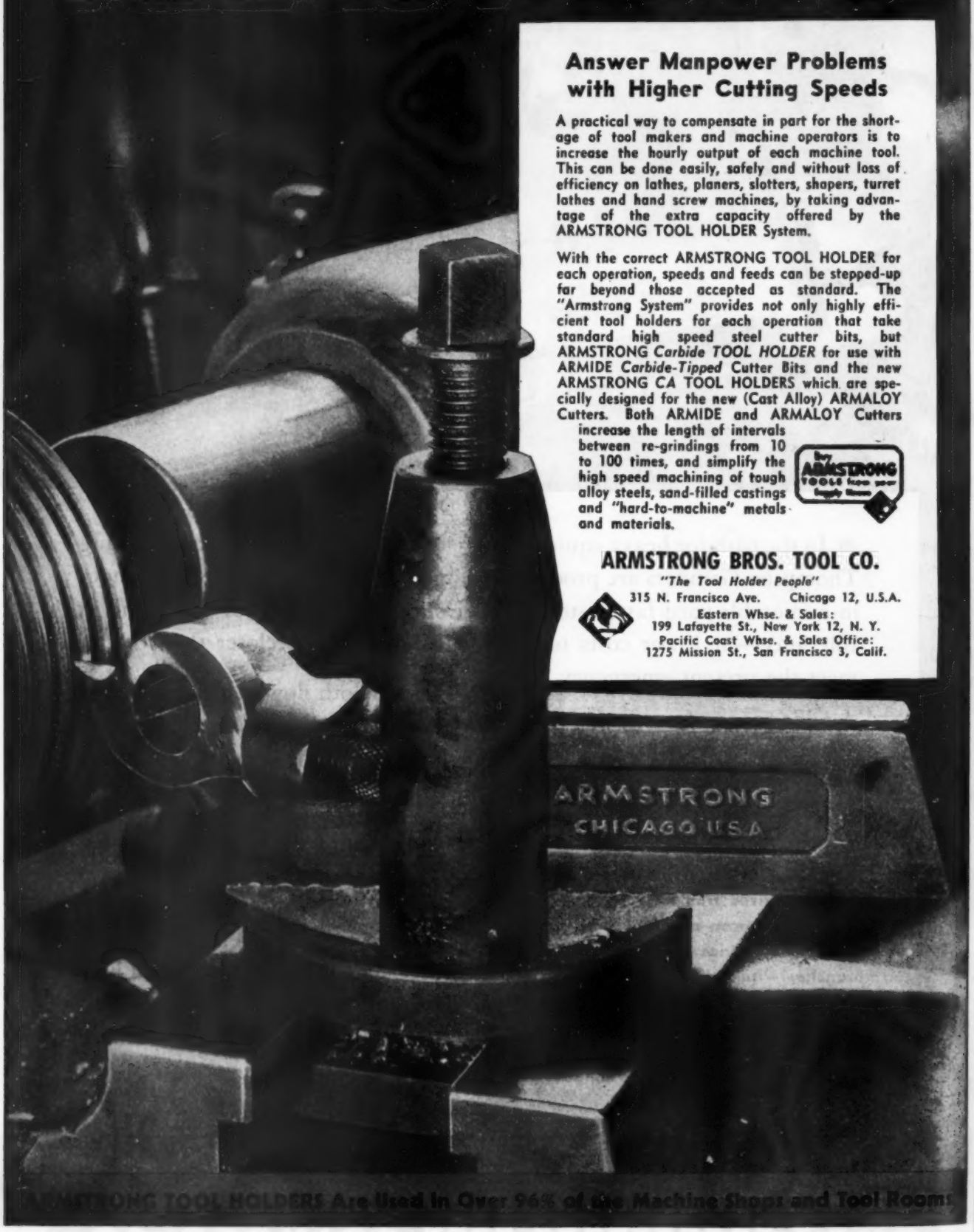
THOMPSON *Surface* GRINDERS

Thompson Surface Grinders are furnished in sizes from 6" x 18" to 36" x 240". Thompson also builds Broach Grinding Machines (for round or flat broaches)—full automatic and hand feed types—Machine Tool Way Grinding Machines with single and dual heads—Slot Grinding Machines for grinding precision slots and tongues.

THE Thompson GRINDER CO.

SPRINGFIELD, OHIO

ARMSTRONG



Answer Manpower Problems with Higher Cutting Speeds

A practical way to compensate in part for the shortage of tool makers and machine operators is to increase the hourly output of each machine tool. This can be done easily, safely and without loss of efficiency on lathes, planers, slotters, shapers, turret lathes and hand screw machines, by taking advantage of the extra capacity offered by the ARMSTRONG TOOL HOLDER System.

With the correct ARMSTRONG TOOL HOLDER for each operation, speeds and feeds can be stepped-up far beyond those accepted as standard. The "Armstrong System" provides not only highly efficient tool holders for each operation that take standard high speed steel cutter bits, but ARMSTRONG *Carbide TOOL HOLDER* for use with ARMIDE *Carbide-Tipped* Cutter Bits and the new ARMSTRONG CA TOOL HOLDERS which are specially designed for the new (Cast Alloy) ARMALOY Cutters. Both ARMIDE and ARMALOY Cutters increase the length of intervals between re-grindings from 10 to 100 times, and simplify the high speed machining of tough alloy steels, sand-filled castings and "hard-to-machine" metals and materials.

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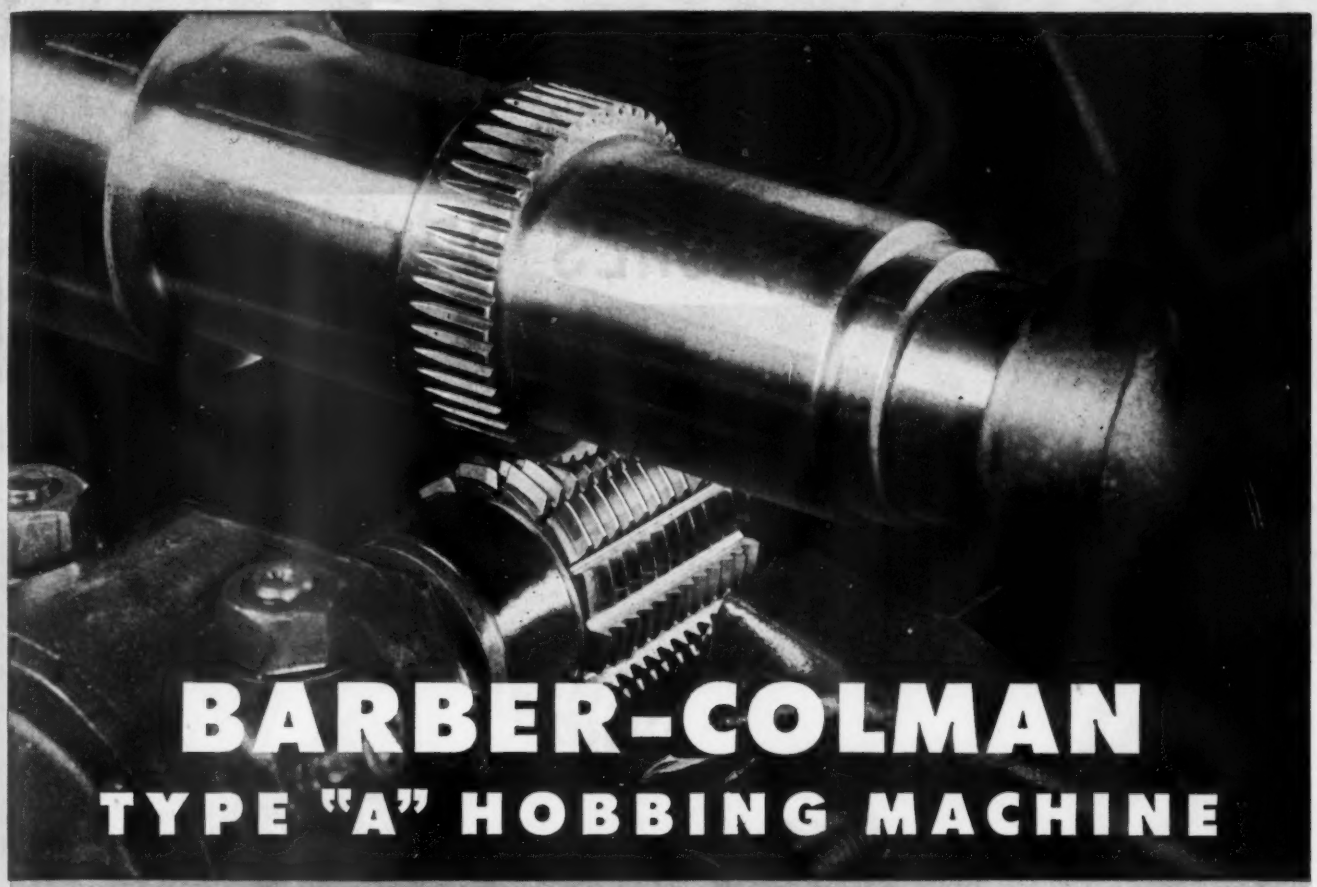
ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms



BARBER-COLMAN
TYPE "A" HOBBING MACHINE

HANDLES UNUSUAL SPLINE HOBBING JOB WITH HIGH ACCURACY IN TOUGH SAE 4340 STEEL, 262-293 BRINELL

Material of crankshaft: SAE 4340, 262-293 Brinell. *Dimensions* of splined portion: 3.0626" O.D., 1" face, 48 teeth, 30°P.A. involute spline. *Setup:* .040" feed per rev. of work, 140 r.p.m. hob speed. Floor-to-floor time: 18 min. *Hob data:* 4 settings, 24 pieces per setting, 96 pieces per grind, .030" removed per sharpening, 15 sharpenings per hob.

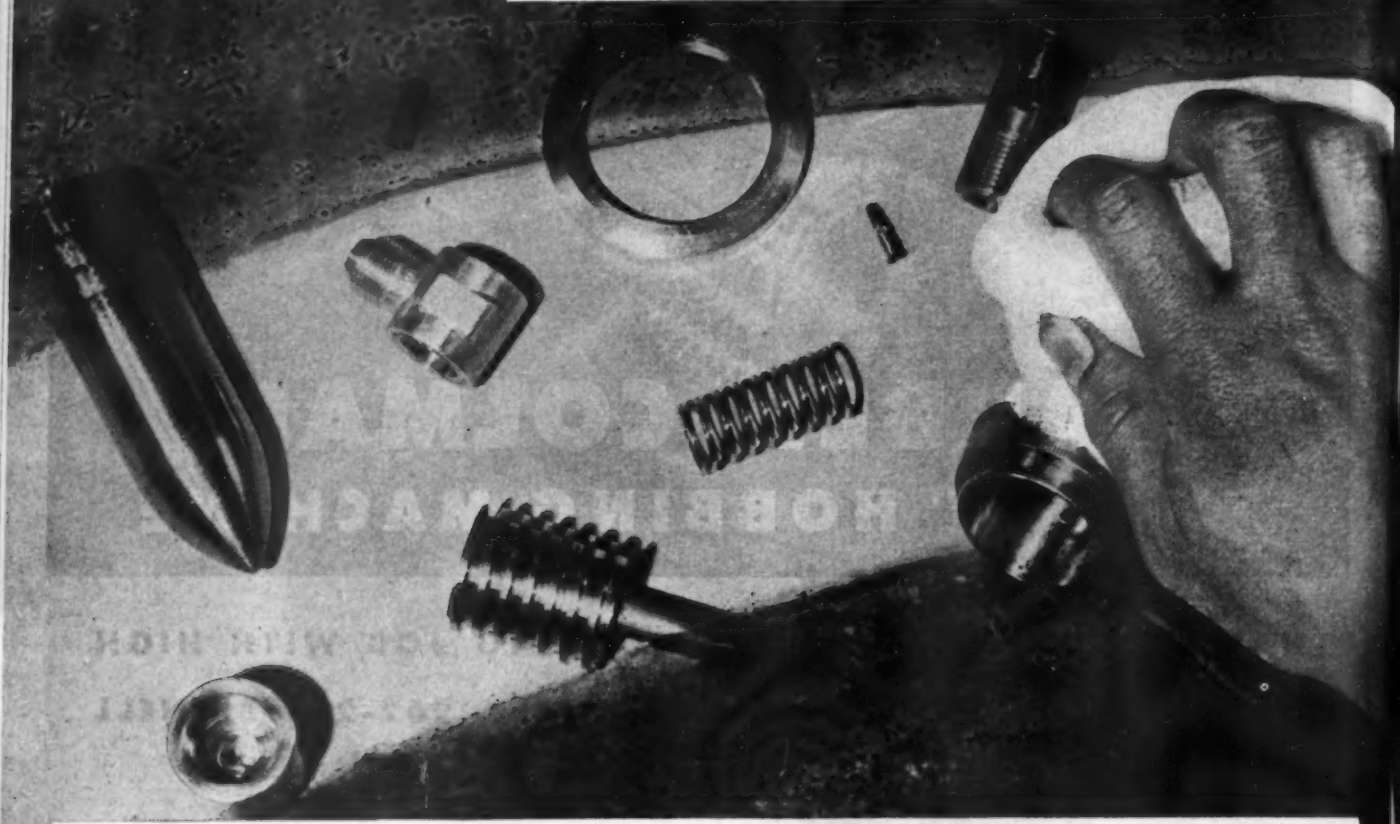
The Barber-Colman Type "A" will handle the unusual as well as the ordinary run of hobbing jobs, as demonstrated by this example. Here is a big, tough steel crankshaft used in an important marine engine, requiring the hobbing of involute serrations near one end. Furthermore, there are close limits on tooth thickness and pitch diameter, and the splines are located in specified relation to the crank throws. The machine used is a B-C Type "A" with 40-inch extra length bed, a special work-holding clamp, and an additional work steady rest on the overarm. The tooth thickness is held to +.000"/−.001" and the pitch diameter to ± 001". This method on this machine shows a saving of 12 minutes over former production time. *Use Barber-Colman Hobbing Machines where the going is tough and accuracy requirements are high.*

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS

SPEEDS AWAY OILY FILM

SLASHES DRYING TIME



SUN SPIRITS

quickly removes dirty oil . . . evaporates cleanly . . . saves time

Produce the parts . . . clean them . . . and finish them fast! And one of the important steps in the production race is getting rid of that greasy film of dirt, gum and oil as quickly as possible. Every short-cut in cleaning is a cut in production time — that's what one large New York metal working plant discovered.

Drying time dragged and an oily film remained on metal parts they were producing. This slowed production and also the electroplating which was the next operation.

Film trouble vanished when they switched to Sun Spirits. Drying time was speeded up and better parts were obtained for electroplating.

For efficiency, economy and speed in metal cleaning, switch to Sun Spirits. This modern cleaner requires no heating . . . no mixing. Simply dip, wipe or brush parts . . . or use Sun Spirits in cleaning machinery designed for petroleum solvents, Write for details to . . .

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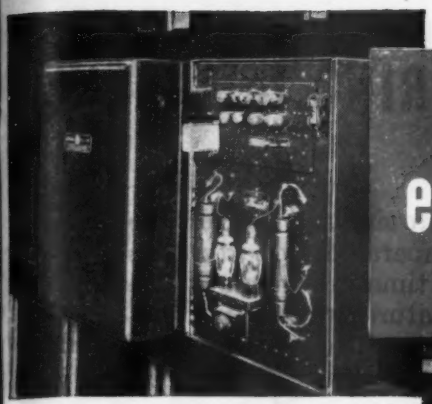
SUNOCO

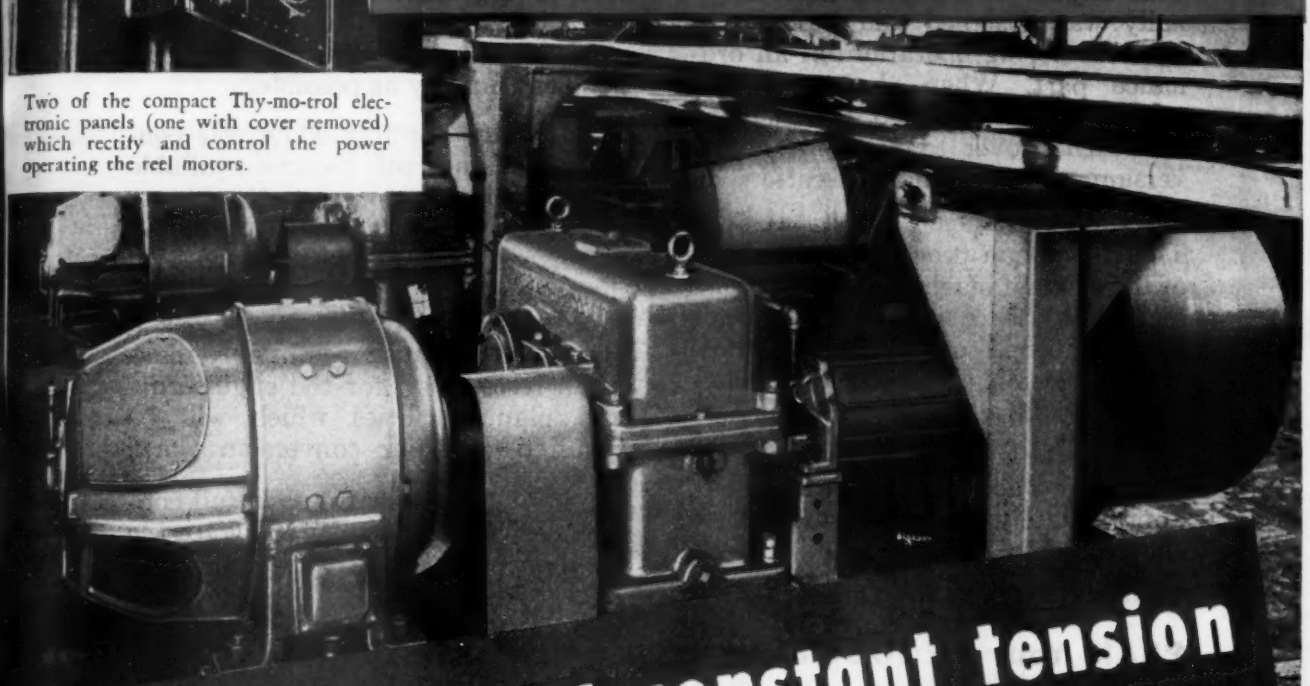
SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTRY



Two of the compact Thy-mo-trol electronic panels (one with cover removed) which rectify and control the power operating the reel motors.

electronic self-adjusting drive



...coils strip at constant tension

Thy-mo-trol d-c drive motors (400/1600 rpm) operate through speed reducers to provide the required reel speed. Motor field-control automatically reduces speed as coil diameter builds up, holding tension constant.

At Allegheny-Ludlum Steel Corp., West Leechburg, Pa., smooth, constant-tension coil winding is now possible on the delivery reels of strip-annealing furnaces. The mechanical problems of slip-clutch operation have been eliminated. Full flexibility to handle strip speeds from 3 to 12 fpm is provided. The drive adjusts itself to the speed changes required to allow for coil build-up from 16 to 40 inches in diameter.

OPERATES FROM A-C POWER

Operated from an a-c power source, 2-hp Thy-mo-trol drives on these small reels give the same stepless speed control and torque control that is obtained with larger d-c adjustable voltage systems on mill drives. The operator sets a tension-adjusting rheostat at the desired value, and this level is held throughout the wind-up of the coil.

WIDELY APPLIED

This is only one of the increasing number of Thy-mo-trol applications throughout the steel industry, where stepless speed control, constant acceleration, or constant speed under changing loads is required.

You buy Thy-mo-trol drive as a complete, co-ordinated set of equipment, including d-c motor, electronic panel, transformer, and control station. *Standard* drives can be obtained from 1/8 to 25 hp. G-E engineers will help you select and apply Thy-mo-trol drives, or explore their suitability for new types of jobs. To read the full story, ask for Bulletin GEA-4025. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

676-176-8930

Buy all the BONDS you can—*and keep all you buy*

THY-MO-TROL DRIVE

Conversion Job... from BORING to MILLING

and at a substantial saving in machine cost

This Snyder two-way machine originally was designed and built for a medium boring operation on an ordnance part. When that particular contract was completed, the machine was turned over to Snyder for conversion to a milling operation on another ordnance part.

The conversion process utilized most of the original machine including base and units. Two single-spindle heads were mounted on each end, these being hydraulically operated and electrically controlled by push button.

Besides the considerable saving in time, there accrued also a saving of approximately 50% as compared to the cost of a new machine.

Many machines now operating on war contracts are similarly convertible and offer comparable opportunities for savings in time and money. The time-saving feature will be particularly important when the objective is to reach markets with civilian goods as quickly as possible.

Anticipating the day when war contract machines will become available for conversion to peacetime production, we suggest that you get in touch with us now with the idea of discussing your machine conversion problems and objectives and—as a farsighted precaution—possibly making a reservation for the engineering and plant facilities which will be required for your conversion work.

We invite you to write us in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich.*

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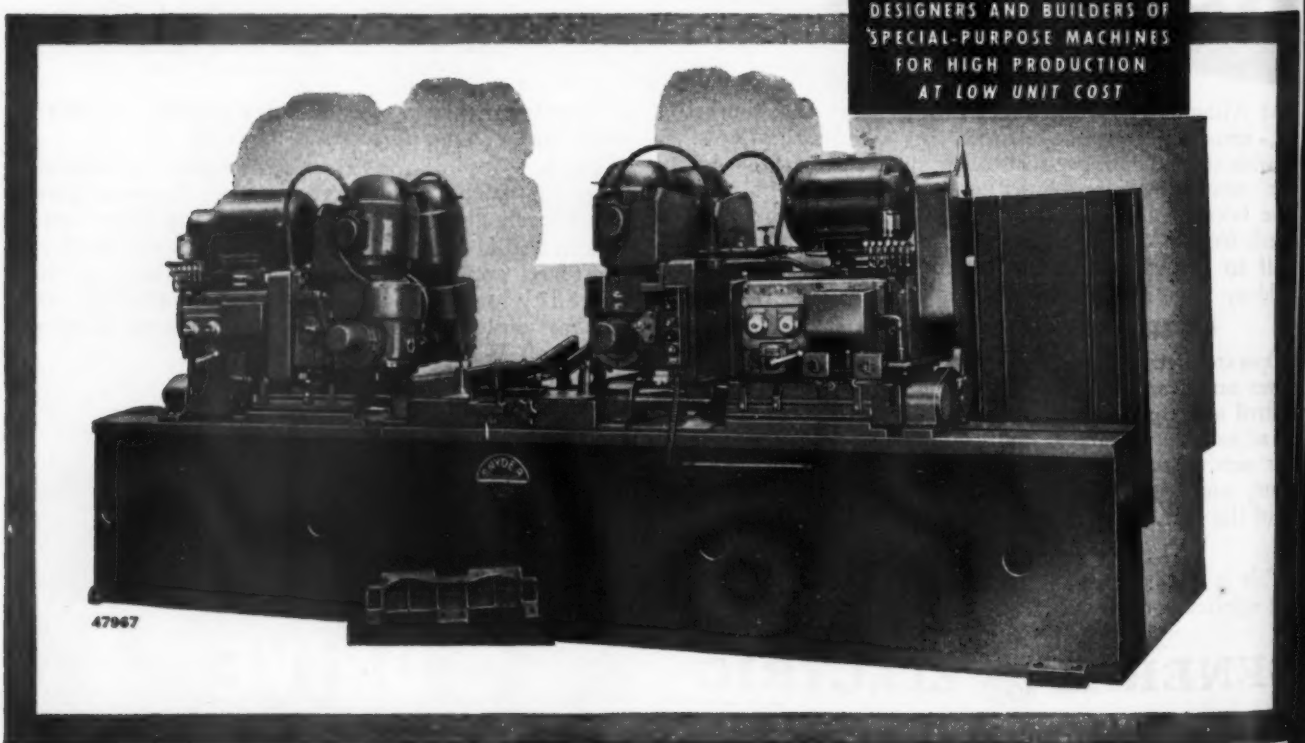
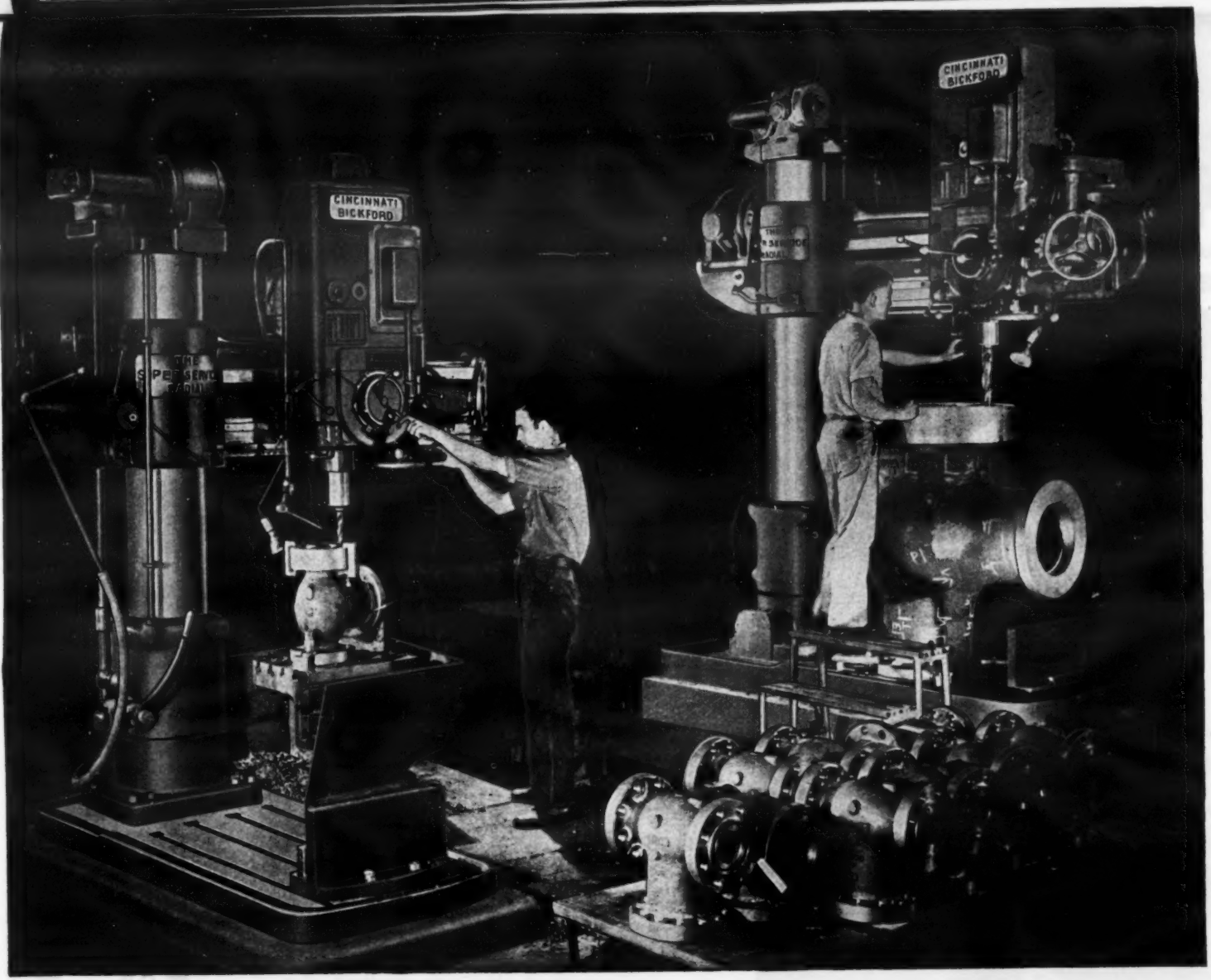
SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST





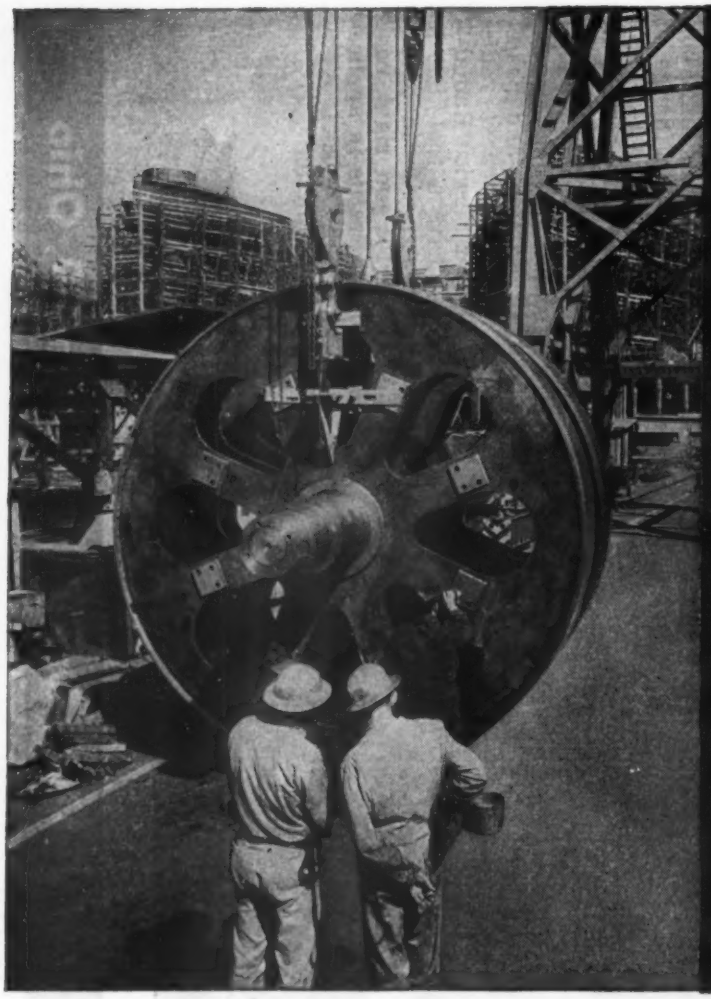
"Productive" IS THE WORD FOR SUPER SERVICE RADIALS

They're "going to town" on war jobs in plants, arsenals, shipyards all over the nation—witness this battery of Super Service Radials at The Edward Valve & Mfg. Co., Inc., in East Chicago, Ind. *Left*, operator is drilling the end flanges of a 4" valve for 900 lb. service at 750° F. *Right*, drilling bolt holes on the bonnet flange of the body casting of a 14" valve which will go into service at 1500 lb. and 950° F.

For greatest production per dollar in wartime and peacetime, make your next radial drill a Super Service Radial—and you'll have a tool that is fast, accurate, safe in operation, powerful and rigid, easy to handle, versatile in application, and built to last! Write for detailed bulletin.

ARMY E NAVY

THE CINCINNATI BICKFORD TOOL COMPANY, Oakley, Cincinnati 9, Ohio



TRIUMPH OF *Know-how*

THE manufacture of reduction gears, as originally designed, seriously threatened to bottleneck Victory ship production. Reason: a scarcity of hobbing machines big enough to handle 128-in. diameters. The difficulty is now overcome by slight design changes . . . decreasing bull gear diameters, for instance, to allow use of available 120-in. hobbers . . . reducing face widths . . . and, in some designs, cutting both helixes simultaneously through use of two hobbing heads . . . all this appreciably shortening hobbing time and increasing hobbing capacity.

In addition, faster machining, better finish and longer tool life are assured through use of suitable cutting fluids . . . such as Texaco Cutting and Soluble Oils, outstanding in performance and used everywhere throughout the metal working field.

Texaco cutting fluids cool and lubricate the tools, carry away heat and prevent chip welding, thus lengthening tool life, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States.

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TEXACO **TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING**

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOON

Towards Better Use of Manpower

SOME astonishing figures have come to light about the manpower needs of our war industries.

The most recent count among so-called "must" war plants, those most vital to production of critical war goods, reveals a shortage of only 113,000 men.

To narrow the issue further, around 40,000 of these workers are wanted by only 23 plants, which are principally in the shipbuilding and ship repair industries.

Most of the shops in which shortages now exist can be brought up to full strength by the addition of less than 60 men in each shop. Aside from the relatively few plants already mentioned, no factories are paralyzed or threatened with a breakdown in schedules because of lack of adequate working forces.

There are reputed to be 1,500,000 men classified as 4-F in other than essential jobs. The armed services have honorably discharged 1,300,000 men, many of whom are available for war industries, and 400,000 more will be discharged by the middle of the year.

From these facts one deduces that the manpower requirements of our war industries do not involve staggering shortages in numbers of men and that the trouble is fairly well localized.

The problem will be made more acute, of course, by the quotas to be drawn this year for the Army, Navy and Marines. Even so, the situation is not so bad as some people will have us believe.

If we could find a satisfactory solution, or a partial solution, for three problems in connection with manpower, none of which has anything to do with providing a *larger* labor force, we probably could produce all the war goods that are required.

The first problem is to get people to work in the right places. They must be in war plants in preference to non-war jobs. More than that, they must be in war plants with top priority rating if those plants are short of men, rather than plants holding lower ratings.

The second problem is to get more work out of people now employed. One of the great complaints of manufacturers in many war industries is that too many men will not put in a full day's work for a full day's pay. Loafing on the job has been revealed by the Mead Committee as a widespread practice in the shipbuilding yards. Unfortunately it is not confined to shipbuilding.

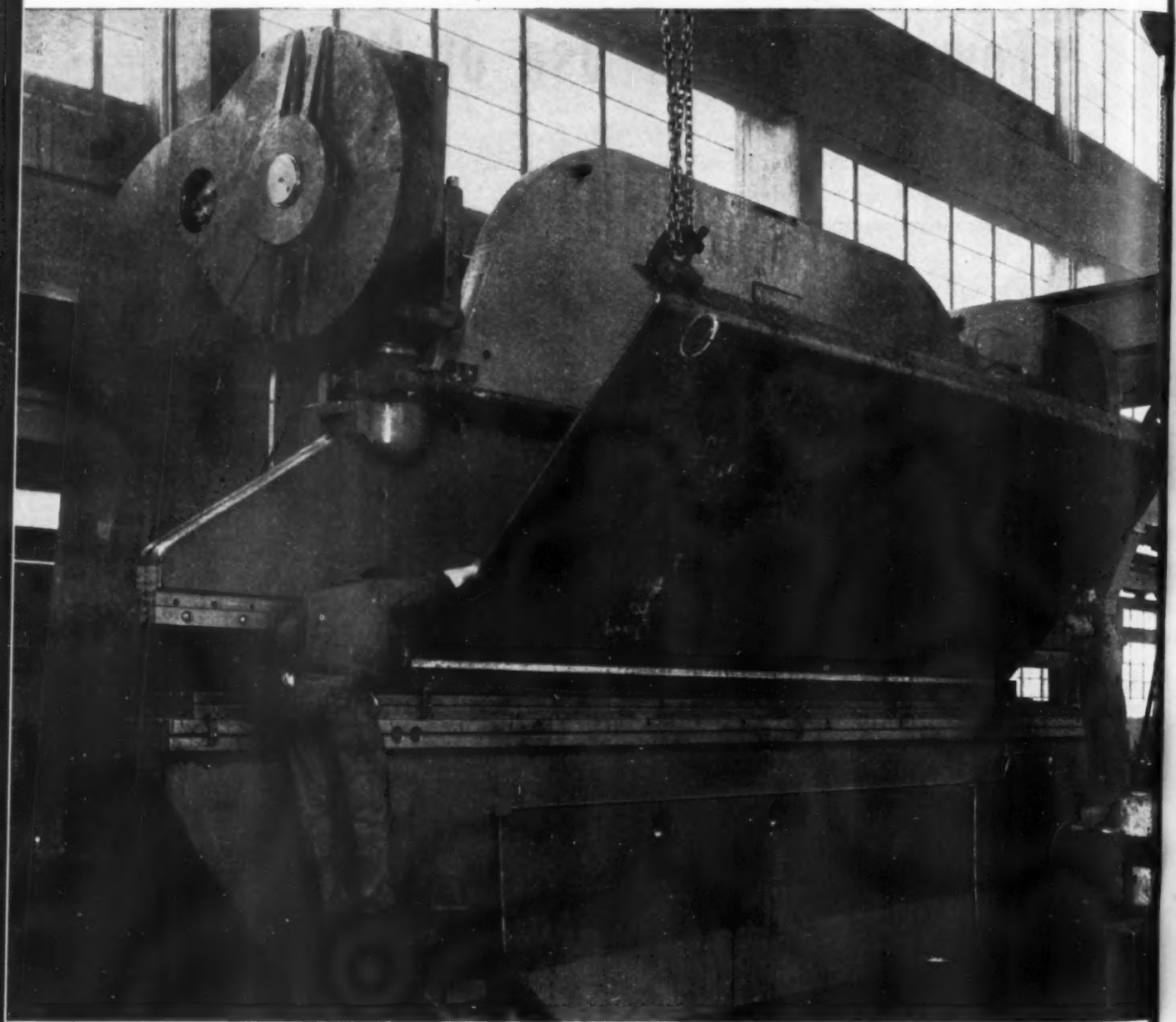
In the same breath with "soldiering" and loafing should be mentioned the tendency of unions to hold down production to a predetermined level, regardless of the capacity of the individual worker to turn out more than the average.

The third problem is to get more stability in the working forces of war plants and thereby reduce the turnover. The "quit" rate in many war industries is disturbingly high. A responsibility rests upon both employers and employees to help reduce this rate. Working conditions should be made as attractive as possible; and workers in turn should be more willing to stay put for the duration.

If we utilize what we already have to better advantage, our manpower problems in war industries will be less severe and we shall be able to squeeze nicely through the critical months ahead.

Burnham Finney

One Stroke bends a 3/4 inch Steel Plate 20 feet long



New manufacturing requirements have been met by the largest two housing mechanical brake in the world. Operating with machine tool accuracy, this Cincinnati Press Brake—weighing 125 tons with twenty feet between housings and thirty feet of over-all die surface—exerts 1000 tons pressure and in construction required the use of the largest rolled steel plates ever produced.

Write for our Catalog No. B-2 on Press Brakes and their many uses.

THE CINCINNATI SHAPER CO.

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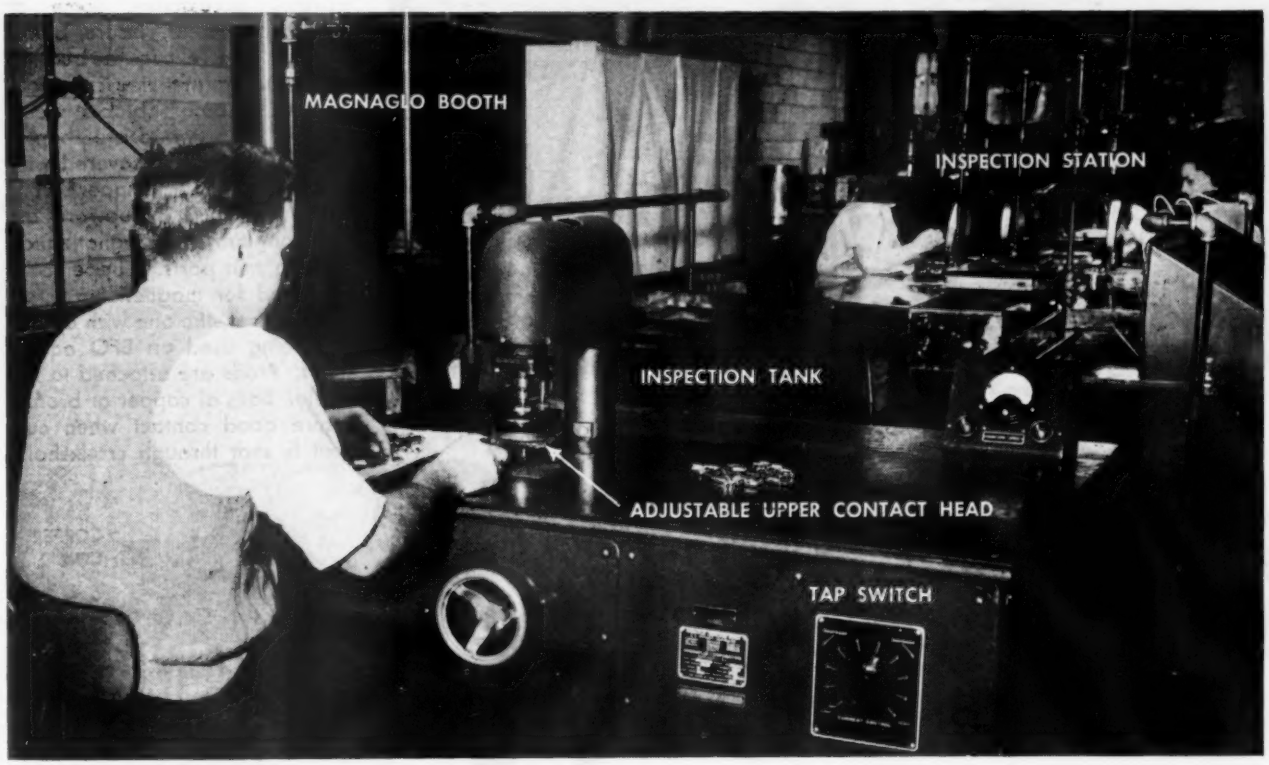
SHAPERS · SHEARS · BRAKES

Magnetic-Particle Testing Stations Reveal Surface Defects Rapidly

BY F. W. ROHDE, CHIEF INSPECTOR, MANAGER OF QUALITY CONTROL
PLANT 2, JACOBS AIRCRAFT ENGINE COMPANY

Magnaflux units are located close to machining operations to detect invisible flaws in highly stressed engine parts. This prevents needless work on materials that are faulty

INSPECTION of highly stressed aircraft-engine parts cannot safely depend on dimensional and visual checks. Invisible surface and subsurface flaws must also be located by means of magnetic-particle testing. We knew this long before actual manufacturing operations were begun; Magnaflux units were already in use for checking experimental pieces. And since then we have had ample opportunity to learn how vitally important the process has been toward realization of the high quality standards to which we aspired. For besides revealing flaws in manufactured parts, magnetic-particle testing has effected the improvement of such processes as casting, forging, grinding and heat-treating, and thereby reduced scrap. In fact, nearly all of our de-



Unit installations for Magnaflux and Magnaglo inspection are arranged to save work-handling and steps. Here small parts such as tappet roller pins are magnetized on a BFQ machine, are quickly transferred in batches to the inspection tank and then the inspection table

partments have been faced with conditions which have been analyzed successfully with Magnaflux equipment so that corrective measures could be taken.

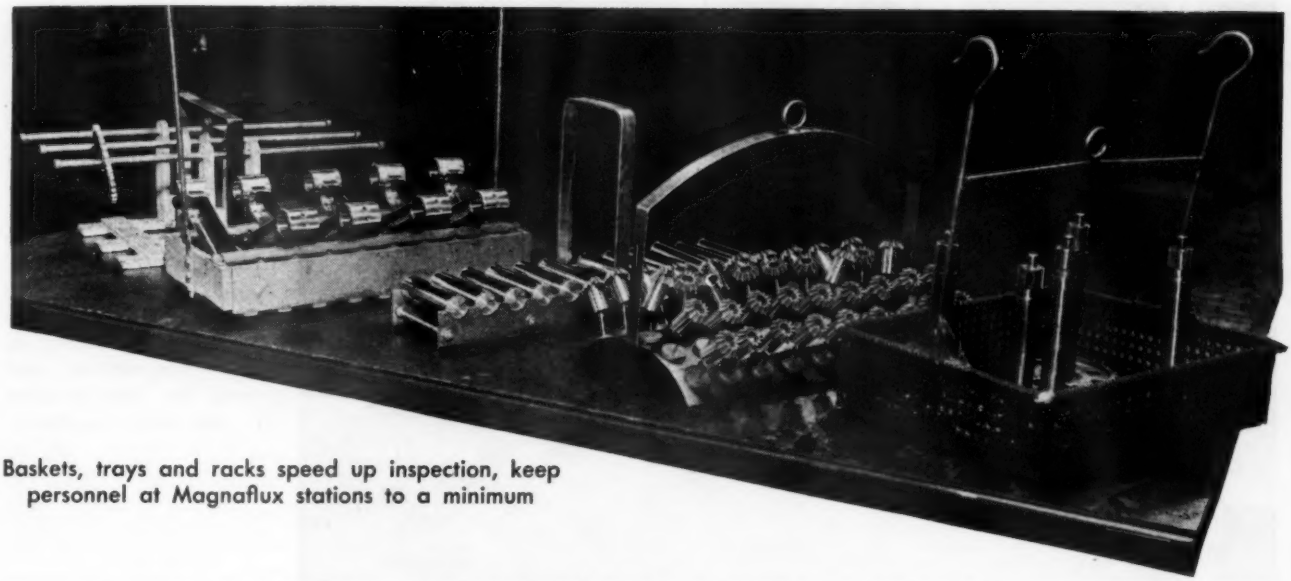
To produce an engine of outstanding quality and dependability, it was determined to use an appreciable percentage of floorspace in a completely new and modern plant for inspection operations. To maintain processing efficiency at a high level and avoid time lost in transporting parts to inspection, Magnaflux units were placed close to preceding operations. This eliminated excessive handling and an involved record system. Another advantage was that Magnaflux operators soon became expert and highly specialized. The more proficient workers were moved from unit to unit until they had broad experience. Thus, several levels of skill were created, supervision was less of a problem, and well-qualified personnel were available to handle emergencies. For example, although accuracy is considered more desirable than speed, some of the Magnaflux inspectors can quickly check a batch of purchased parts so that the waste of flawed material or faulty workmanship can be stopped promptly at the source.

Progressive policy in selection of method and equipment is required when quality-control standards are of a high order. The Magnaflux, Magnaglo and Zyglo processes are all used according to requirements of the part or inspection problem. In the Magnaflux process, steel parts are magnetized between contact heads which induce a pre-determined field, or flux, in the desired direction. The parts are then immersed in a constantly agitated bath of light oil, in which has been suspended a paste containing ferromagnetic particles. As the bath flows over the parts, the magnetic particles are drawn into and held by leakage fields existing at the defective area, to create a line or pattern known as an "indication." These indications, according to their character or build-up make possible a translation of the defect.

In the Magnaglo process, the paste used in the bath has the additional quality of being fluorescent, so that indications glow brilliantly under black light. Adoption of Magnaglo was deferred until thorough tests demonstrated that it afforded about 20 times greater visibility of the indications. However, the process does not necessarily in-

Although mostly used for large parts, the ANQ machine can be fitted with long contact blocks for safe and efficient handling of small pieces

Various accessories, some of them homemade, insure better contact and eliminate burning when the magnetizing current is applied. Contact blocks made of fiber or plywood are shaped to fit the part, are covered with copper braid. Copper coils ranging from 3 in. upward assist longitudinal magnetization of long thin parts. Copper bars are used for magnetizing internal surfaces, the one with a handle being used on BFQ equipment. Prods are attached to the cable. Balls of copper or bronze insure good contact when current is shot through crankshafts



Baskets, trays and racks speed up inspection, keep personnel at Magnaflux stations to a minimum

crease the range of work that can be inspected with greater confidence. As a matter of fact, few relevant Magnaglo indications have been found by inspectors after nothing was discovered by Magnafluxing. But the greater visibility of Magnaglo indications, and the consequent reduction in the task of seeing them, has been the chief motive for installing this process despite its higher cost. Typical Magnaglo inspection operations have to do with checking for imperfections on dark surfaces, in thread roots, at the bottom of keyways, in corners, the inside of oil holes and small grinding checks. Larger parts are normally Magnafluxed. An exception is the cylinder barrel, where the hard to see areas between the fins and in the internal thread makes Magnaglo preferable despite cost. False indications common to Magnaflux do not build up so strongly in Magnaglo because the smaller concentration of magnetic particles is not as easily attracted by weak leakage fields. Objections to the process—stuffiness of the darkrooms and eyestrain from effects of ultra-violet light—are easily overcome by proper ventilation and proper goggles.

Parts made of non-magnetic materials, such as aluminum, bronze, magnesium and austenitic steels, cannot be inspected with the Magnaflux or Magnaglo processes. So we use the Zyglo process, in which the surface defects are discovered by fluorescent indications where a compound has penetrated into the flaws. These indications are produced by dipping the parts in a solution containing the Zyglo penetrant, removing the pieces, holding them for a pre-determined time until the fluorescent material has penetrated into the flaws, rinsing the parts in warm water, checking them under black light for adherence of excess penetrant, developing in a compound that draws the penetrant out of the flaws by capillary action to magnify the indications, and finally exposure under black light. This process is used to check parts that appear to be scratched because it has the facility to show the depth of minute surface flaws and may even reveal deep cracks, as long as they have an opening to the surface. For this reason, parts deemed "questionable" after inspection by one of the other methods are also submitted to Zyglo inspection.

Magnetizing Units Studied

Selection of magnetizing units for Plant 2 was based upon a careful analysis of several factors, such as: types of work to be handled, ease and rapidity of operation, avoidance of mistakes and maintenance. We chose a.c. rectifier units capable of magnetizing the workpieces in the longitudinal or circular directions, by supplying rectified d.c. power. This type of equipment was selected because of constant current output and freedom from maintenance and battery-charging problems. Three types of these units were considered necessary for our program:

1. For numerous small parts—the Magnaflux BFQ unit which is capable of rapid production by either the wet-continuous or dry-residual magnetizing methods.

2. For large parts—the Magnaflux ANQ apparatus, which is adapted to the wet-method of continuous inspection, and is capable of high amperage shots (2,500 amp. or more).

3. For cylinder barrels—the Magnaflux AECQ machine which is specially designed for this purpose, and which is capable of rapid production.

In the BFQ unit, the upper contact plate is operated by a treadle-controlled air cylinder, and can be adjusted vertically with respect to the work height. The lower contact plate is flush with the table top. When the treadle is depressed, the upper contact plate closes upon the work at a preset pressure. The amperage desired is set with a tap switch to secure the correct flux density in the part when the current is applied.

Advantages of the BFQ unit for magnetizing small parts are:

1. Rapid operation is secured by confining the work area so only wrist and hand motions are needed for loading and unloading pieces.

2. The operator sits relaxed at the machine; he need merely place the piece vertically into contact with the lower plate.

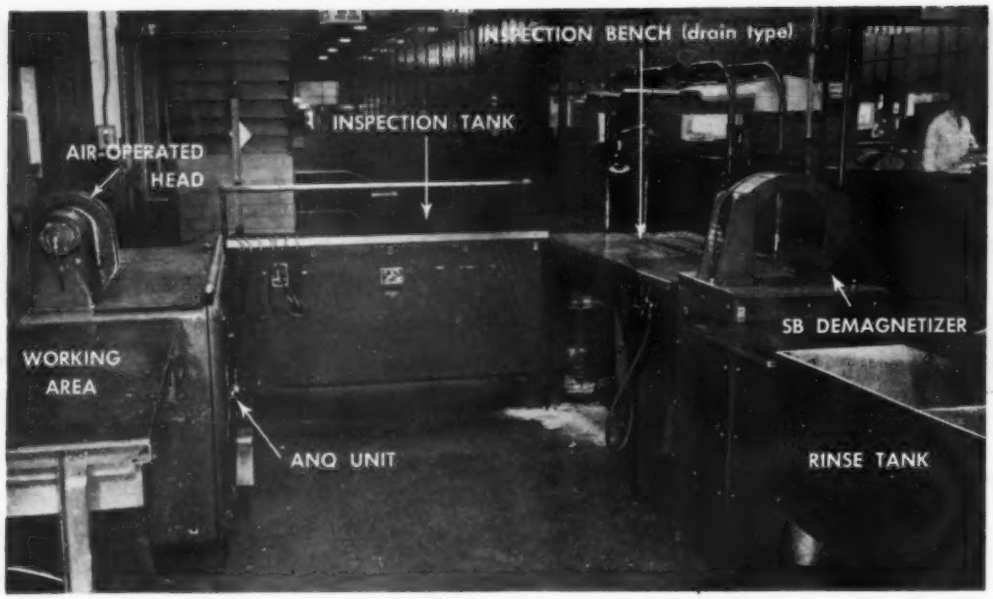
3. The possibility of failure to close the contact heads prior to shooting the part is remote, and thus the burning or dropping of parts is avoided.

4. Fatigue is reduced on continuous operation.

5. Small contact blocks of fiber, copper sheeting and braid can easily be applied to the machine for best handling of various small parts.

6. Magnetized parts can be stacked quickly in baskets, trays or pin racks for immersion in the bath and subsequent rinsing.

A double compartment XTWN tank is placed adjacent to each BFQ magnetizing unit. In one compartment, the pump-circulated bath consists of Varsol and mineral seal oil in which 1½ oz. of either red or



A U-shaped layout for a Magnaflux unit station saves steps, concentrates the working area, is especially valuable when workpieces require two or more magnetizing shots as the magnetizing unit and the demagnetizer are close together

black Magnaflux paste is suspended per gallon of solution. The mineral seal oil reduces dermatitis and other skin ailments. In the right-hand tank compartment, clear Varsol is kept for rinsing the parts following immersion in the bath. Indications are readily found on the rinsed parts, because Varsol drains rapidly from the metal and leaves a clear surface.

Following inspection and Magnaflux stamping, the parts are demagnetized on SB type equipment, which operates on single-phase, 440-volt, 60-cycle a.c. Parts are drawn individually through the coil and out to a distance of at least two feet. This leaves the part satisfactorily demagnetized. Some demagnetizers for large parts, such as crankshafts, are equipped with a track and carriage for introduction and withdrawal of the pieces.

Our large parts require magnetization by means of a current shot involving from 2,500 to 3,000 amp. For this reason, the ANQ unit, which has a maximum current output of around 4,500 amp., is employed. Operation of this unit differs from the BFQ machine. The part must be held horizontally between the contact plates, one of which is attached to an adjustable tailstock while the other is operated by an air cylinder. For longitudinal magnetization of the workpiece, a solenoid coil is moved on guide rails to the desired location and locked. If circular magnetization is employed, copper balls, copper-braided contact blocks or prods are used in conjunction with the contact plates. Thus, prior to operating the unit, the operator must be sure that it is energized and that the transfer switch is in the correct position to supply current through the solenoid or the contact plates as required.

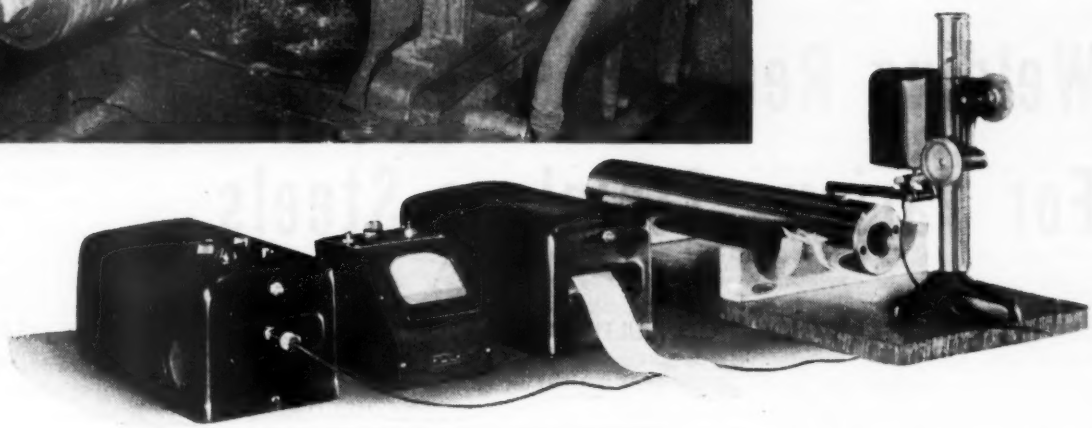
In setting up the ANQ unit, the operator must set the air pressure gage, so that the left-hand contact plate closes upon the piece with sufficient pressure to retain it in position during the current shot. In the case of a crankshaft, this is the method followed: The right-hand contact head is moved into position and locked, leaving sufficient room to place the part between the heads. A small copper ball is attached to the left-hand movable contact plate. The bore at the pin end of the crankshaft is put into contact with this ball. Then a larger copper ball is inserted in the larger bore at the other end of the horizontally held workpiece. The treadle is operated to move the left-hand contact plate to the closed position. About 2 in. travel of the head is permitted, and the operator must be careful not to catch his fingers. After the operator is sure that the cylinder has locked the part in position between the heads, he applies 3,000-amp, current for an interval determined by a timer.

Magnetizing Crankshafts

To speed production, a number of crankshafts are magnetized prior to immersion. To place shafts in the tank conveniently, a pipe rack runs lengthwise over the center of the tank, and copper or bronze hooks are applied to hold the parts. Following inspection and demagnetization, the shaft is again placed in the ANQ unit for longitudinal magnetization. While the shaft is held in between the contact heads, the magnetizing coil is moved first to the front section of the shaft and a 1,500 amp. current shot is applied, after which the coil is moved to the rear section and another shot is made.

Magnaflux inspection of the cylinder barrel is carried out in an AECQ machine. A cylindrical tank large enough to hold the barrel and a magnetizing coil for longitudinal magnetization are built into the left side of the unit. A Varsol suspension containing from 2 to 3 oz. of Magaflux black paste per gallon is constantly circulated within the tank. Circular magnetization is achieved by two contact plates, the upper one of which is movable. The unit is provided with a transfer switch for selecting circular or longitudinal magnetization, a relay timer for establishing the duration of the current shot, and a tap switch for setting its value. Fluorescent lamps are placed directly over the inspection table. Washing and demagnetizing of the barrel are handled in a Varsol spray chamber built into the right-hand side of the machine.

Each Magnaflux inspection station is designed for efficient operation. Although sufficient working area is supplied, the units are closely grouped to secure a layout saving time and footsteps, especially for parts that require two or more magnetizing shots. By following the principle of supplying adequate inspection equipment close to proceeding manufacturing operations we have maintained rigid quality control at least expense, and have produced an engine of outstanding quality and dependability.



Left—Superfinishing the recoil cylinder is done in two stages. Here the "roughing" operation produces a series of dull bands on the workpiece, somewhat akin to a scraped surface in general appearance. Below—A final Superfinishing operation creates a highly reflective surface, and one moreover for which the surface roughness lies within 3 to 5 microinches, according to the Brush surface analyzer

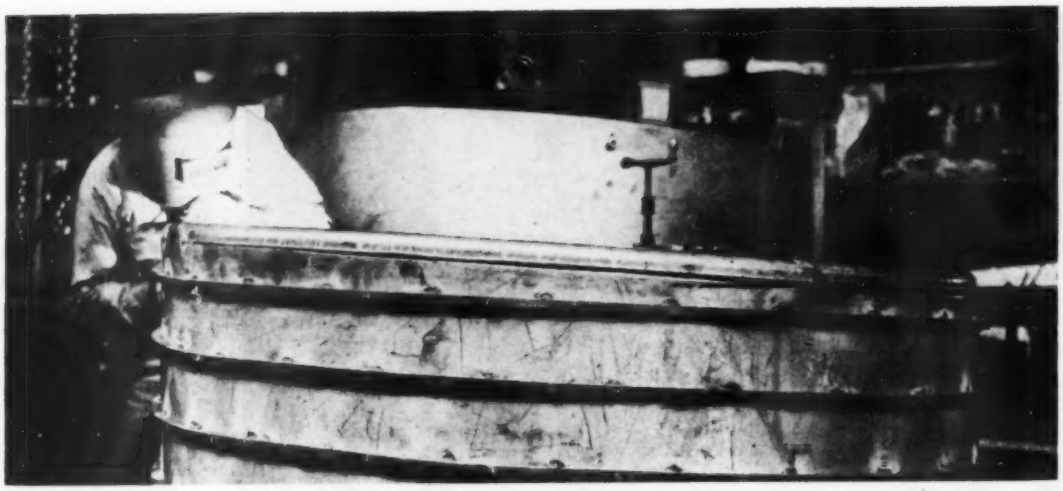
Recoil Cylinders for Navy Guns Finished to Three Microinches

RECOIL CYLINDERS for Navy 5-in. guns must be finished to a profilometer reading of 5 microinches over their entire length of 24 in. The cylinders are being finished to 3 microinches by the Huntington, W. Va., Works of the International Nickel Company, largely through application of its experience in the mirror-finishing of large rolls for producing high-nickel alloys in sheet and strip. The shop operates on the theory that a good grinding job is absolutely essential to production of satisfactory surface-finish on the K-Monel recoil cylinders.

The cylinders are hollow. They come to the grinding room with the O.D. accurately turned with respect to the bore. Here, the cylinders are fitted with bull centers and mounted in a Landis grinder. Grinding is done in two stages.

Rough grinding produces a surface of 30-60 microinches. Details of the set-up are: workspeed, 670 r.p.m., a 60-grit wheel which is 3 in. wide; wheel traverse as fast as the wheel will allow. Finish grinding seeks to produce a surface finish of 7 microinches. The wheel is of 150-grit, and the bond is selected to avoid fishtails. Slower wheel traverse is required in order to avoid slits.

Superfinishing is done with 1×1×6-in. stones held in a screw feed attachment. For roughing, a 600-grit silicon-carbide stone is used. The operator does a section of the cylinder at a time, and makes four passes over the entire length. When he completes the Superfinish roughing operation, the finely ground surface has been replaced by one consisting of a series of dull bands. The finishing operation, however, creates a highly reflective surface, is obtained with four to five passes of a 600-grit, or finer, aluminum-oxide stone. If the stones have the correct characteristics, they will break down to the correct curvature for contact with the cylinder.



This pasteurizer tank of welded design consists of a stainless-steel shell to which ribs are welded with intermittent beads

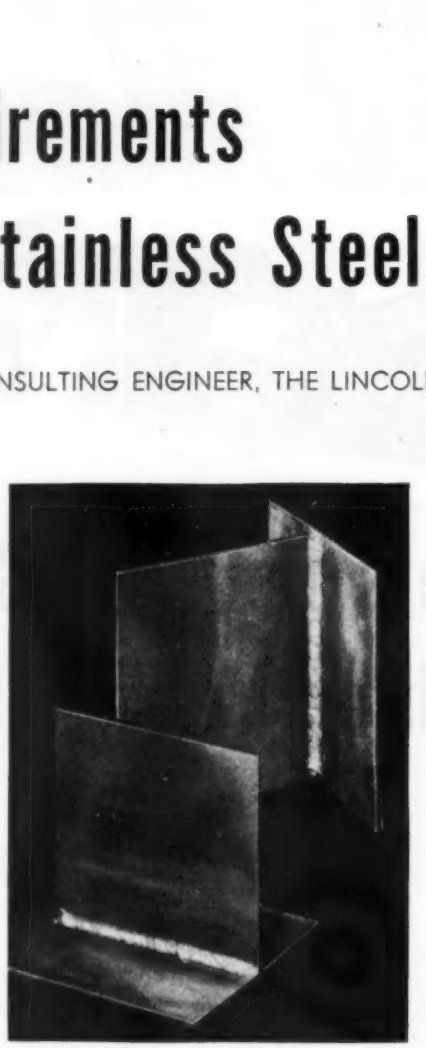
Welding Requirements For Various Stainless Steels

BY W. J. CONLEY, CONSULTING ENGINEER, THE LINCOLN ELECTRIC COMPANY

In the second and final article on welding stainless steels, the choice of electrodes and other welding factors are discussed

THE SELECTION of electrodes for welding any type of stainless steel does not differ materially from the procedure used in choosing the proper rod for any other type of metal. To choose the electrode most suited for a particular requirement, it is necessary to know: (*a*) the chemical composition of both base metal and weld metal, and the corrosion resistance of each; (*b*) the type of joint to be welded; (*c*) the position in which the weld is to be made; and (*d*) the condition of the fit-up. Careful consideration of these factors contributes to a welded joint that will be as strong as, or stronger than, the material being welded.

The general procedure for mild steel welding should be followed, taking into consideration the stainless steel characteristics which differ from those of mild steel. They are higher electrical resistance, lower thermal conductivity, and higher thermal expansion (about 50 percent greater than mild steel).



Weld specimens in 16-gage stainless steel—a fillet weld in the downhand position, and a vertical fillet weld

Compared with carbon steels, stainless steels are poor conductors of heat and electricity. Current settings should be regulated to produce just enough heat to effect good fusion.

Steels of the straight chromium variety are somewhat similar to carbon steels in that they have a high coefficient of expansion. Consequently, steels of the 18-8, 25-20, and 25-12 type are subject to distortion and warping which must be controlled during welding.

It is important to prepare and fit the work carefully. The edges should be clean of all foreign material. To maintain accurate alignment during the process of welding, the work should be held by fixtures that clamp tightly or by tack welding. Some fixtures or jigs employ cooling arrangements which absorb excess heat besides holding the work rigidly. Uniformity in the width of the gap all along both top and bottom edges of the joint will eliminate unwanted variations

in thickness, penetration, and quality of bead.

Direct current is generally used with the electrode positive and the work negative. The arc length should be as short as possible without sticking.

Avoid Excessive Weaving

Electrodes ¼ in. or larger should be used with caution to avoid undue loss of chromium. Excessive weaving in any size should be avoided. In general, a weld made with a number of straight beads is recommended. The slag must be thoroughly cleaned from each bead before another bead is applied.

Although many satisfactory stainless steel welding jobs are performed by depositing the complete weld from one side of the work, certain conditions make it desirable to butt weld a joint from both sides to obtain additional corrosion resistance. Under such circumstances, the first bead of weld metal is deposited to supply the major physical strength required. The second bead is frequently ground down flush with the surface of the parent metal. Typical examples of this sequence of welding are found in the fabrication of tanks and containers used in the chemical and food processing industries.

The first bead and the adjacent areas are thus subjected to a second heat cycle when the lighter bead is deposited on the reverse side of the joint. Higher temperatures cause solution of the carbides and thus make the area less corrosion resistant. Because the second bead is subjected to a lower heat cycle, there is a tendency for less precipitation of carbides along its grain boundaries. Therefore the weld area on the second bead side of the structure should be exposed to the corrosive material to be handled in the structure.

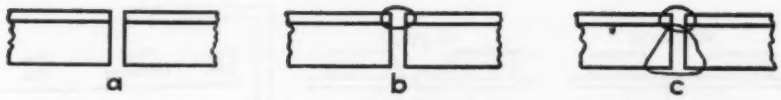
Heavily coated stainless electrodes should be used. The core wire should be of approximately the same analysis as the plate. Columbium either in the electrode or in the coating is usually used in certain types of 18-8 and 25-12 stainless to minimize intergranular corrosion.

After welding, discoloration may be noted for a short distance on each side of the weld. This is a surface oxide formed by the high heat of welding. Regarded as a harmless surface condition, it can be removed by pickling or by grinding and polishing.

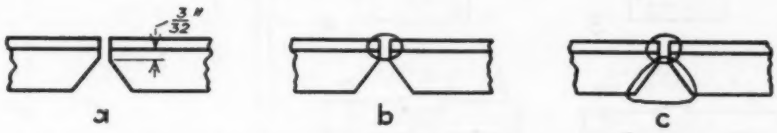
A few typical applications have been chosen and the welding procedures outlined for general guidance. The speeds given in the tables are welding time only with no allowance for fatigue, cleaning, setting up, and other items that vary greatly in different shops.

Any specific application should be studied carefully and the procedure modified accordingly, taking into consideration such conditons as quality of weld, fit-up, and the rate of dissipation of heat for various plate thicknesses.

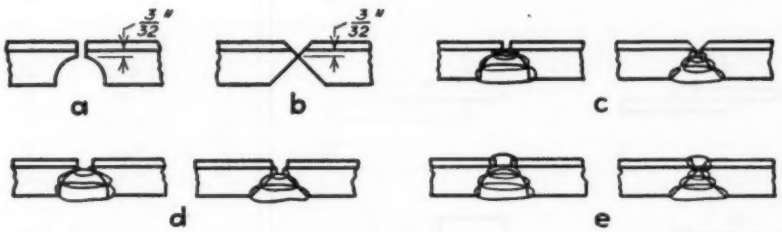
The pounds of electrodes per foot



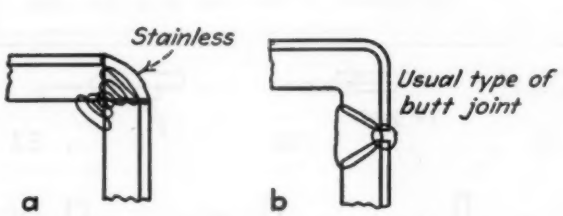
Stainless-clad steel sheets 12 gage and thinner are spaced the same as steel sheets of the same thickness (a). Weld on the stainless side (b), and complete with a weld on the steel side (c). Both welds are made with a 25-12 electrode



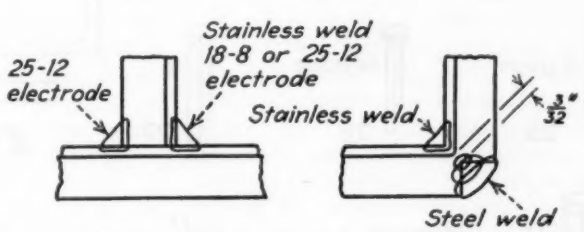
Stainless-clad sheets 10-gage to 5/16-in. thick must have the edge beveled by chipping or grinding (a). Leave a shoulder of mild steel about 3/32-in. thick under the cladding and space the plates as for mild steel. Using a stainless electrode, weld the stainless side (b). Complete the joint by welding on the mild steel side (c), using a shielded electrode



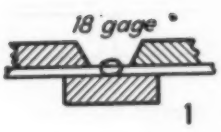
Planing equipment should be used to prepare stainless-clad plates 3/8-in. and heavier. Cut either a U-groove with a 3/32-in. shoulder under the cladding (a) or a double V-groove with the point of the V 3/32-in. below the cladding (b). Weld the steel side first, using multiple beads with a mild steel shielded electrode (c). Chip with a pneumatic hammer or grind with a narrow, rubber-bonded wheel (d), and complete the joint by welding the stainless side with a stainless electrode (e)



Multiple beads with a stainless electrode are necessary in making a corner weld (a). The corner weld can be avoided by using a butt weld near the corner (b)



Right-angle intersections are sometimes necessary in the construction of stainless-clad tanks. Two methods of making such welds are illustrated



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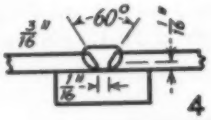
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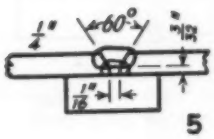
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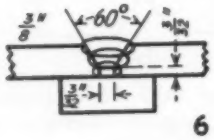
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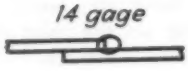

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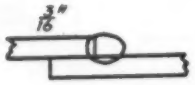
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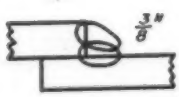
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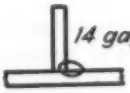

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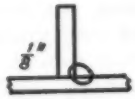
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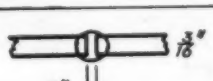
Fig. No.	Plate Thickness	Pass No.	Wire Size	Amp.	Arc Speed In./Min.	Arc Speed Ft./Hr.	Lb. Electrode Per Ft. of Weld
			BUTT WELDS				
1	18 gage	1	5/64	45	15	75	0.020
2	14 gage	1	3/32	60	12	60	0.038
3	1/8 in.	1	1/8	90	9	45	0.08
4	3/16 in.	1	5/32	125	7	35	0.150
5	1/4 in.	1	5/32	125	6	17.5	0.34
		2*	3/16	160	8		
6	3/8 in.	1	5/32	125	6		
		2	3/16	160	8	12	0.51
		3*	3/16	160	8		
			LAP WELDS				
7	18 gage	1	5/64	45	13	65	0.023
8	14 gage	1	3/32	65	13	65	0.036
9	1/8 in.	1	1/8	90	13	65	0.056
10	3/16 in.	1	5/32	125	10	50	0.105
11	1/4 in.	1	3/16	160	6.5	32.5	0.22
12	3/8 in.	1*	3/16	160	8	21.25	0.34
		2	3/16	160	9		
			FILLET WELDS				
13	18 gage	1	5/64	45	9	45	0.034
14	14 gage	1	3/32	60	9	45	0.052
15	1/8 in.	1	1/8	90	9	45	0.079
16	3/16 in.	1	5/32	125	7	35	0.149
17	1/4 in.	1	3/16	160	5.5	27.5	0.262
18	3/8 in.	1*	3/16	160	5.5	17.5	0.40
		2	3/16	160	8.5		
			CORNER WELDS				
19	18 gage	1	5/64	45	19	95	0.018
20	14 gage	1	3/32	60	15	75	0.028
21	1/8 in.	1	1/8	90	13	65	0.057
22	3/16 in.	1	5/32	125	11	55	0.094
23	1/4 in.	1	3/16	160	7	35	0.21
24	3/8 in.	1	3/16	160	8	17.5	0.40
		2*	3/16	160	6		
			EDGE WELDS				
25	18 gage	1	5/64	45	20	100	0.015
26	14 gage	1	3/32	60	18	90	0.025
27	1/8 in.	1	1/8	90	15	75	0.047
28	3/16 in.	1*	5/32	125	12	60	0.087
			VERTICAL BUTT WELDS				
29	14 gage	1	3/32	50	8.5	42.5	0.041
30	1/8 in.	1	1/8	65	6	30	0.087
31	3/16 in.	1	1/8	65	3.5	17.5	0.150
			VERTICAL LAP WELDS				
32	14 gage	1	3/32	50	6	30	0.058
33	1/8 in.	1	1/8	65	5.5	27.5	0.091
34	3/16 in.	1	1/8	80	5	25	0.123
			VERTICAL FILLET WELDS				
35	14 gage	1	3/32	50	4.5	22.5	0.092
36	1/8 in.	1	1/8	65	4.5	22.5	0.120
37	3/16 in.	1	1/8	80	4	20	0.151

* Use slight weave.

Note: Copper back-up bar should be grooved approximately 3/16-in. wide by 1/16-in. deep.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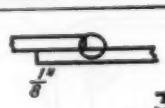
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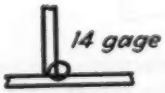

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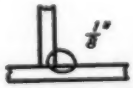
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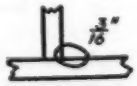
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of weld will vary with different conditions. The data given are for an average fit-up with little reinforcement, and include waste and stub ends.

Vertical Welding

It is generally advisable to weld up in vertical welding. The technique is similar to that for vertical welding of mild steel.

In general the same preparation, fit-up, and currents as used in vertical welding apply to overhead welding with the exception that the weld is made generally with a number of straight beads. Care must be taken to clean thoroughly all slag from each bead before another is applied.

Welding Stainless Clad

Two sides are to be welded, the stainless side and the steel side. Electrodes should be of the proper analysis for the cladding being welded. In the case of 18-8 cladding it has been found that the 24 percent chrome 12 percent nickel electrode offers a corrosion resistance equal to or superior to that of the stainless surface. However, the 18 percent chrome 8 percent nickel electrode (with a carbon content not to exceed 0.08 percent) is successfully used. When welding sheets thinner than 3/16 in., it is advisable to use an electrode with a higher alloy content than that of the material being welded.

When welding the lighter gages of stainless clad use chill bars wherever possible, since it is necessary to cool the weld and adjacent metal quickly. On heavy material this is not necessary as the mild steel backing acts as a chill.

Since 80 percent of the total thickness of stainless clad is normally mild steel, the heat is dissipated more rapidly than would be the case with solid stainless steel. This natural advantage of stainless-clad steel combined with the low carbon content of the stainless surface eliminates, in practically all cases, the necessity for heat-treatment after welding.

In welding the mild steel side of stainless-clad plate it is desirable to weld with multiple beads to avoid overheating of the stainless surface. A general purpose shielded-arc electrode is recommended.

Stainless and Mild Steel

Generally an electrode of 25-12 analysis is used to weld stainless steel to mild steel. A general purpose shielded-arc electrode is also used in some cases with excellent results. It must be recognized that some place in the joint there is a transition from the stainless steel to mild steel. The welded bead should be made in multiple passes to minimize the amount of dilution. Use the lowest current consistent with good fusion. Where it is necessary to make the weld in one pass, a 25-12 or 25-20 electrode is preferred because it gives a deposit of higher ductility.

4-6 Percent Chromium Steel

Electrodes available for welding 4-6 percent chromium steels generally contain molybdenum. The weld deposit possesses a higher creep strength, and has other desirable qualities.

Bearing in mind the general characteristics of 4-6 chromium steel and its air-hardening qualities in particular, considerable care should be observed in regard to the suggestions for keeping the material to be welded warm during welding and its annealing afterwards. Otherwise the weld, and particularly the area adjacent to the weld, will be quite brittle and will withstand little stress, particularly bend stress and shock.

The material to be welded should be purchased in annealed condition. The parts to be welded should be preheated to at least 400-500 F. to prevent cracking during welding. In no event should preheating be less than 300 F. The work should not be allowed to fall below this temperature at any time. Immediately after welding—and before the work is allowed to cool—it should be placed in an annealing furnace. A stress relief at 1,400 F. is sometimes used. In such cases it is necessary to allow the weld to cool to a point where it transforms (becomes magnetic) before it is put into the furnace. Otherwise it may remain austenitic during the stress-relieving cycle and harden on cooling. Full softness of the weld is attained by a full anneal at 1,600 F. followed by slow furnace cooling. Temperature of the work should not drop over 50 F. per hr. When the temperature has dropped to 1,200 F., the work may be taken out of the furnace and allowed to cool in the air.

Because of its characteristics 4-6 chrome steel should be used with caution where it is not possible to heat-treat after welding. Severe loads should not be placed on the work before heat-treatment since the metal is brittle in the unannealed condition.

In field welding operations on 4-6 chromium steel, where heat-treating after welding is impractical, it is often advisable to use electrodes of 25-20 chrome-nickel type. The high nickel and chrome content of this electrode produces a joint with the line of fusion largely austenitic and comparing favorably in ductility with the parent metal.

12-14 Chromium Steel

Steel with 12-14 percent chromium and a maximum of 0.12 percent carbon is subject to air-hardening and grain growth with resultant brittleness and low impact strength. The carbon in the base metal should be kept as low as possible as this effects the impact strength. Preheat to 300 F. for thin plate and 400 F. or higher for thick plate before welding.

Immediately after welding anneal at 1,250 to 1,350 F. for 4 hours or longer per inch of thickness. A 17 percent chrome electrode is suitable for welding this steel, or an electrode of 18-8 type can be used.

15-16 Chromium Steels

Steel with 15-16 percent chromium and a maximum of 0.10 percent carbon, as with the 12-14 percent chrome alloy, is subject to grain growth and is very brittle if not annealed. It should be preheated to 300 to 400 F.

After welding, it is heated to 1,400 to 1,450 F. and held at this temperature for 4 hr. per in. of thickness and allowed to cool slowly in the furnace. An 18-8 chrome-nickel electrode may sometimes be used, keeping in mind the precautions mentioned under the 11-14 percent chrome. For steel containing 16-18 percent chromium and a maximum of 0.12 carbon, essentially the same procedure is used as for the 15-16 percent range.

25-30 Chromium Steel

Steels containing 25-30 percent chromium with a maximum of 0.30 carbon are not air-hardening but are subject to grain growth. They are weak and brittle in and next to the weld. The course grain cannot be eliminated by heat-treatment. They should be preheated to 500 F., welded, annealed at 1,600 F. with a long soak, and then air-cooled. A 25-30 percent chrome electrode can be used, or a 25-12 chrome-nickel electrode.

Special Twisting Fixture Straightens B-29 Spar Chords

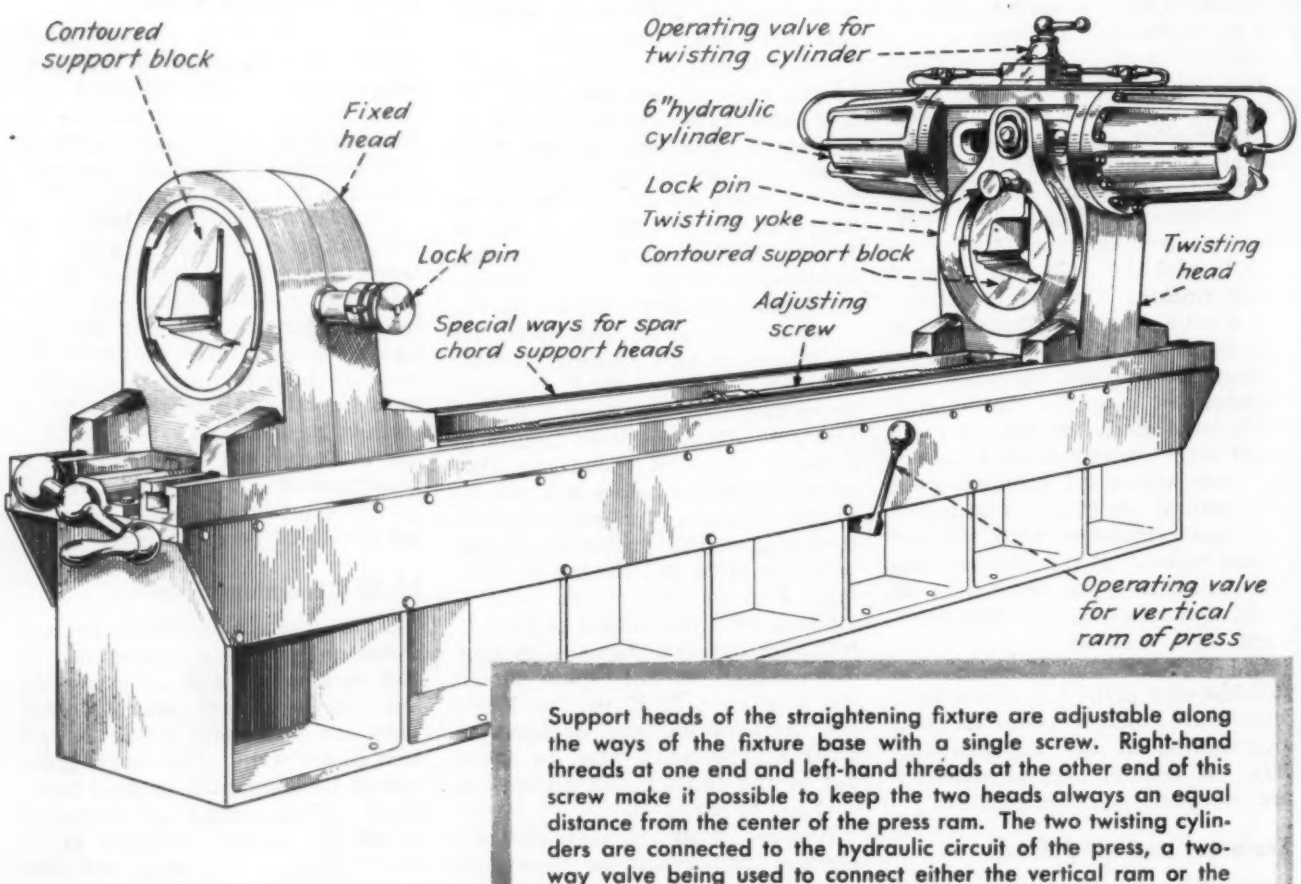
BY HARRY L. GIWOSKY, ASSISTANT SUPERINTENDENT OF TOOLING
WICHITA DIVISION, BOEING AIRPLANE COMPANY

FRONT WING spar chords for the Boeing B-29 "Superfortress" bomber are machined from what is said to be the largest aluminum-alloy extruded section ever made. As delivered from the mills, this extruded section is approximately 25½ ft. long and weighs about 305 lb. Two of these sections, one right-hand and the other left-hand, go into the center wing assembly for each B-29 bomber. When the outside surfaces have been milled to shape and the spar chords have been sawed to length, the weight of each is reduced to about 217 lb.

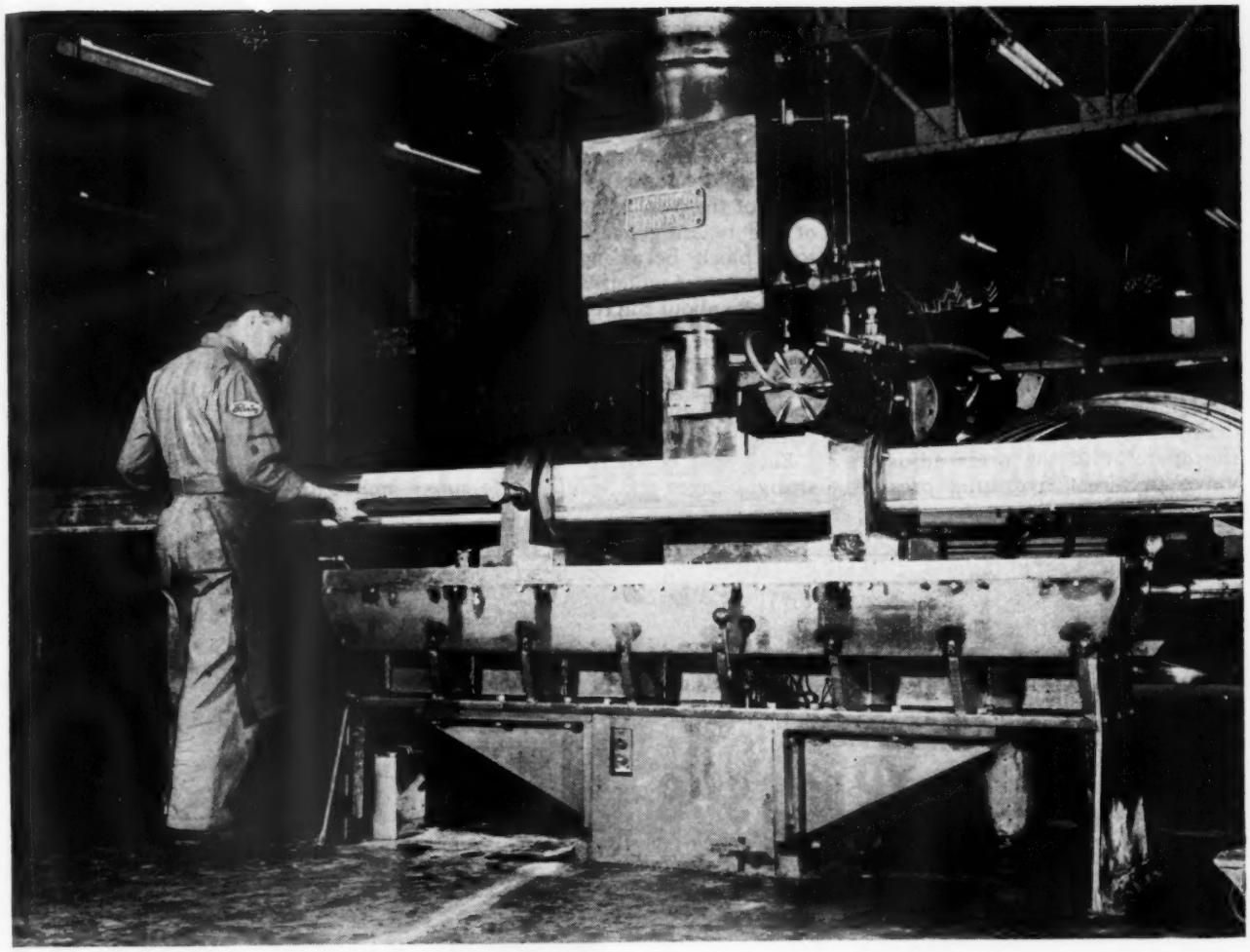
Boeing engineers developed the special device for attachment to a standard press. Different blocks are used in straightening chords before and after milling

Although these front wing spar chords and other smaller chords which go into the wing assemblies are supposedly straight when received at the Boeing-Wichita plant, experience has shown it desirable to make certain of this point before any machining operations are performed. In addition, it is desirable to repeat the straightening operation after the chords have been milled on the outside surfaces and have been cut to length, to make certain that no warping has resulted from the milling operations.

Two types of bends occur in the spar chords, both before and after milling. These include longitudinal bends which can be straightened by supporting the spar between blocks and applying pressure vertically



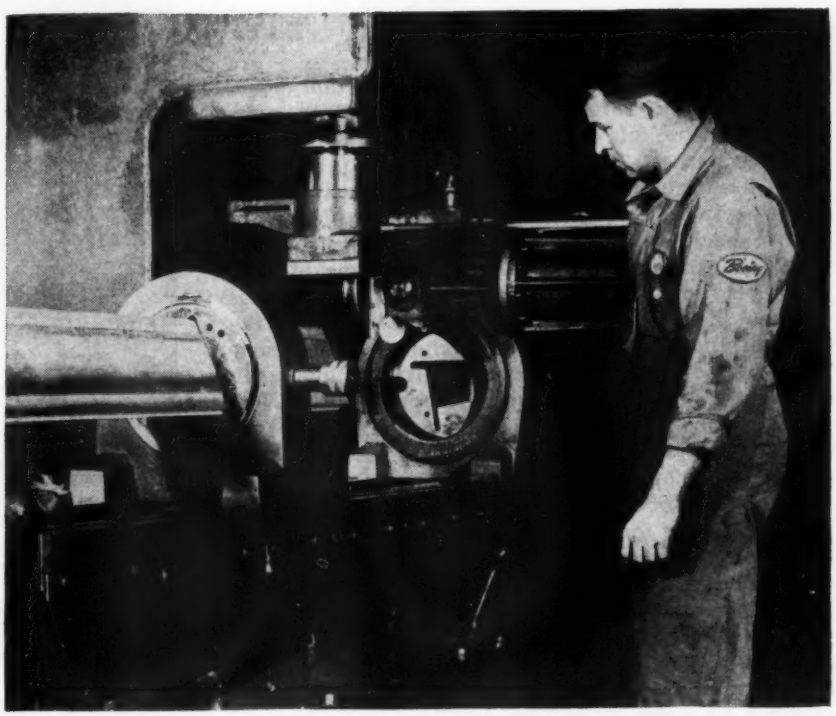
Support heads of the straightening fixture are adjustable along the ways of the fixture base with a single screw. Right-hand threads at one end and left-hand threads at the other end of this screw make it possible to keep the two heads always an equal distance from the center of the press ram. The two twisting cylinders are connected to the hydraulic circuit of the press, a two-way valve being used to connect either the vertical ram or the twisting cylinders to the pump



Extruded aluminum-alloy spar chords for B-29 bomber wings are straightened with this special twisting fixture installed on the table of a standard 35-ton Hannifin straightening press. Longitudinal bends are straightened with the vertical ram of the press in the conventional manner

midway between the supports. The spar chords also may be twisted about their longitudinal axis; no amount of pressure applied at right-angles to the longitudinal axis can correct this condition.

To straighten spar chords accurately and remove either condition of bend, Boeing-Wichita tooling engineers have developed a special twisting fixture which is mounted on a standard Hannifin straightening press. The principal features of this fixture are shown in the accompanying illustrations. The two support heads have contour-bored support blocks which fit closely the contour of the spar chord to be straightened. Varied support blocks are necessary for different spar chords. Different blocks are used in straightening a rough extrusion than those applied



Support blocks in each of the heads of the straightening fixture are contour-bored to fit closely to the surfaces of the spar. A different set of blocks is employed when straightening a milled chord than are used for original straightening of the extruded section as delivered from the mill

to the same spar after milling the outside surfaces. The support blocks are turned to a spherical contour on their outside diameters, and they fit into spherically-bored seats in the support heads. When this unit is to be employed for straightening longitudinal bends, the support heads are moved the correct distance apart and the spar chord is positioned properly in the support blocks to bring the high point of the bend directly under the vertical ram of the straightening press. Then, the press is used in the conventional manner to straighten the spar chord.

However, when the spar is twisted, the operator of the press adjusts a valve to direct hydraulic pressure from the press pump to the cylinders of the twisting head of the fixture, instead of to the regular press cylinder. A pin locks the support block in the fixed head. A lock pin is used to connect the support block in the twisting head to the twisting yoke. Both of the 6-in. hydraulic cylinders of the twisting head are connected to a block between the cylinders, movement of which turns the twisting yoke about the center of the support block. This turning movement, which can be in either direction at the option of the operator, twists the spar chord the amount necessary to remove the twist in the part.

Each spar chord is inspected with straight edges and levels while supported between the two heads of this straightening fixture to make certain that it has been straightened within the tolerances allowed. For long spars, support carriages moved along the floor on casters are used to support the outer ends of spar chords. These carriages have spherical support blocks of the same type used in the fixture heads for the purpose of eliminating damage to the surfaces of the product.

The base of the straightening fixture is of welded steel construction. It is bolted to the table of the straightening press in place of the standard fixture, and is supported at its outer ends with steel plate legs bolted to the floor.

Small Pneumatic Presses

FOR FORMING METAL PARTS

BY LAMONT SWANSON, VICE PRESIDENT,
WINTERS & CRAMPTON CORPORATION

MANUFACTURE of sheet metal ammunition boxes for military aircraft ordinarily is done with press brakes because of clearance requirements. At the plant of Winters & Crampton Corporation, however, it has been found that a relatively inexpensive forming press suitable for making these ammunition boxes can be made from angle and channel iron sections, steel plates and an air cylinder. One type of such presses is shown. It can be adjusted readily to various die shut heights and forming conditions within the limit of the stroke of the air cylinder. The pneumatic presses were designed and built at a time when delivery promised on an expensive punch press with the necessary long stroke was many months off.

Experience has shown that these presses are safe to operate and, for many jobs, are superior to the brake method of forming. The presses have been used for a number of forming operations in the manufacture of ammunition boxes and other parts for military aircraft. One of the larger presses has been adapted for sizing link chutes used on the B-29 "Superfortress" bomber. These link chutes must be made to very close dimensions which could not be held even when using close fitting jigs during spot welding operations. By pushing correctly ground steel rollers through these chutes with a pneumatic press it made it possible to resize the chutes economically. As time goes on it is expected that many other uses will be found for these presses.

Typical small pneumatic press developed for forming operations on military parts is powered by a standard Hanna air cylinder. Foot valve control leaves the operator's hands free for handling parts into and out of the forming dies. The frame is a welded assembly of steel plates and channel iron sections

Clearance and Relief Angles Play a Part in Cutter Performance

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE COMPANY

Number of teeth and proper chip clearance may be found from the material cut and the nature of the milling operation as told in this eighth installment

THE CLEARANCE ANGLE is the angle included between the land on the back or flank of a milling cutter tooth and the tangent to the periphery of the cutter (Fig. 39). The chief function of the clearance angle is to prevent interference between the land and the surface being generated on the workpiece by the cutting edge (Fig. 40).

The clearance angle is always positive and is sometimes referred to as the "primary clearance," since a "secondary clearance" is usually provided to keep a constant width of land and thus prevent eventual interference with the workpiece.

Repeated sharpening of the cutter increases the width of the land to a point where interference with the surface being milled may develop. This effect is shown at point *E* in Fig. 41.

To eliminate interference resulting from cutter resharpening and to maintain the desired width of land without weakening the section of the tooth, a secondary clearance is ground on the back of the tooth, as indicated by the shaded portion in Fig. 41. This angle is usually 3 deg. larger than the primary clearance angle.

The terms "relief" in milling cutters and metal slitting saws refer to the angle provided radially on the *sides* or *face* of a cutter or saw to reduce or eliminate binding and rubbing on the work. The most commonly used values for relief angles vary between 3 and 5 deg. in milling cutters and 1 and 2 deg. in saws.

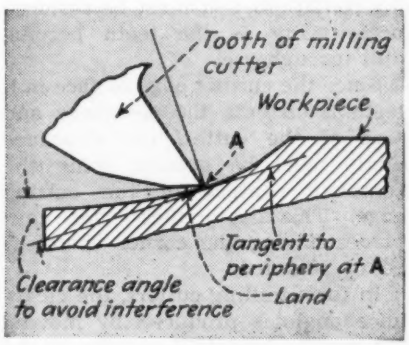


Fig. 40—The function of the clearance angle is to avoid interference between the cutter and the workpiece

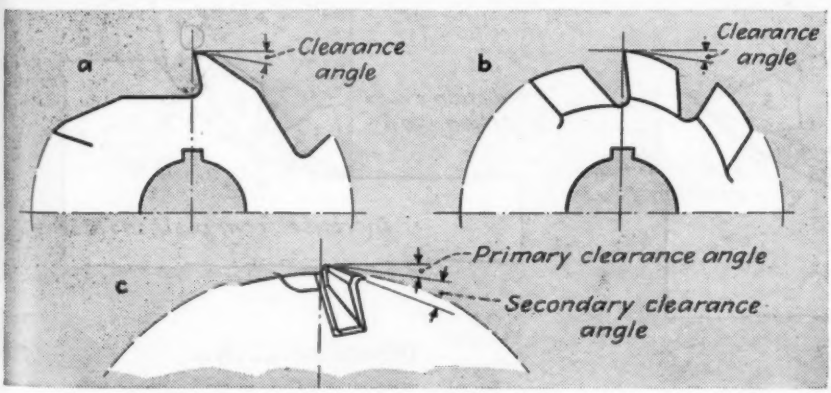


Fig. 39—Clearance angle in milling cutters: (a) Plain milling cutter, (b) Form cutter, (c) Face mill

The clearance angle plays an important role in obtaining good cutter performance, high cutting efficiency, and long cutter life between grindings. It is desirable in all cases to use a clearance angle as small as possible so as to leave more metal for heat dissipation and insure maximum strength of the cutting edge. Any clearance angle greater than that required by the cut will weaken the cutting edge and may cause failure under heavy duty operation. It will also increase the likelihood of "chatter", produce a poor finish on the machined surface and reduce the life of the cutter.

The clearance angle should, therefore, be selected carefully in all

types of cutters. In selecting the clearance angle, it is also necessary to consider that for an equal amount of cutting edge wear, a cutter having a clearance like Outline 1 in Fig. 42 will require regrinding long before a cutter having a clearance like Outline 2.

When a cutter has been used to the point where wear on the cutting edge has eliminated the required clearance, rubbing begins to occur on the land, affecting the surface of the work and resulting in unsatisfactory cutter performance. It is then necessary to restore the original clearance by grinding the cutter. This operation, known as cutter sharpening, or resharpening, is performed on a cutter grinder.

In plain and face milling cutters, the clearance angle is provided by grinding a small land back of the cutting edge. The clearance angle may be changed to suit the operating conditions and must be restored occasionally as the teeth become dull through use.

Since the cutting edge of face mill teeth is on both the periphery and face of the cutter, the clearance angle must be ground along the complete contour of the cutting edge. This also applies to face mill blades having the corner chamfered or rounded.

In form milling cutters, the clearance angle is produced by moving the master form tool radially as the cutter is rotated, thus giving each tooth the contour of the master tool. This type of cutter is sharpened on the face of the tooth, thus preserving the clearance angle and the contour of the profile.

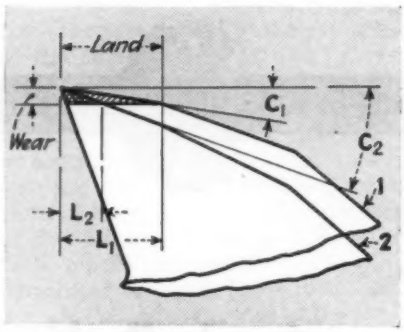


Fig. 41—A secondary clearance may be ground on the cutter teeth to keep the land at its original width

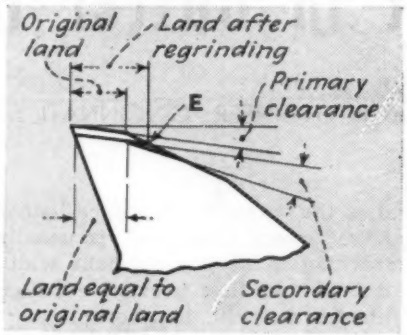


Fig. 42—With a small clearance angle (outline 1) the land increases in width much more rapidly with an equal amount of wear than for the larger clearance (outline 2)

Except for a few standard types such as concave and convex cutters, form cutters are made for special applications, and are manufactured with the proper clearance for the conditions to be encountered in the operation. As an example, form cutters used for milling aluminum may have a clearance angle of 10 deg., while a clearance angle of 4 deg. may be used in cutters for milling hard alloy steel.

Value of the Clearance Angle

For general-purpose work milling cutters from ⅛ to 3 in. in diameter have clearance angles from 13 to 5 deg. respectively, and decreasing proportionately as the diameter increases. The land is usually about 1/64, 1/32, and 1/16 in. wide in small, medium and large diameter cutters, respectively. Cutter manufacturers usually provide a clearance of 4 to 5 deg. in cutters over 3 in. in diameter. The value of the clearance angle is also changed according to the material of the workpiece. See Table V.

The clearance angle which obtains in operation between the land of a tooth and the surface being milled, may be called the *actual or effective clearance angle.* This does not remain constant but varies slightly from the beginning to the end of a milling cutter tooth engagement with the work. Fig. 43 is an exaggerated illustration of the conditions obtained in plain milling cutters when operating in up milling and down milling.

A general formula, which gives the clearance angle necessitated by the feed component, width of land, depth of cut, diameter of cutter, and Brinell hardness, is the following:

$$C = \frac{45860}{D \times B}\left[L + \frac{Fr}{\pi D}\sqrt{d(D-d)}\right] \quad (7)$$

where:

C = Clearance angle, deg.
D = Cutter diameter, in.

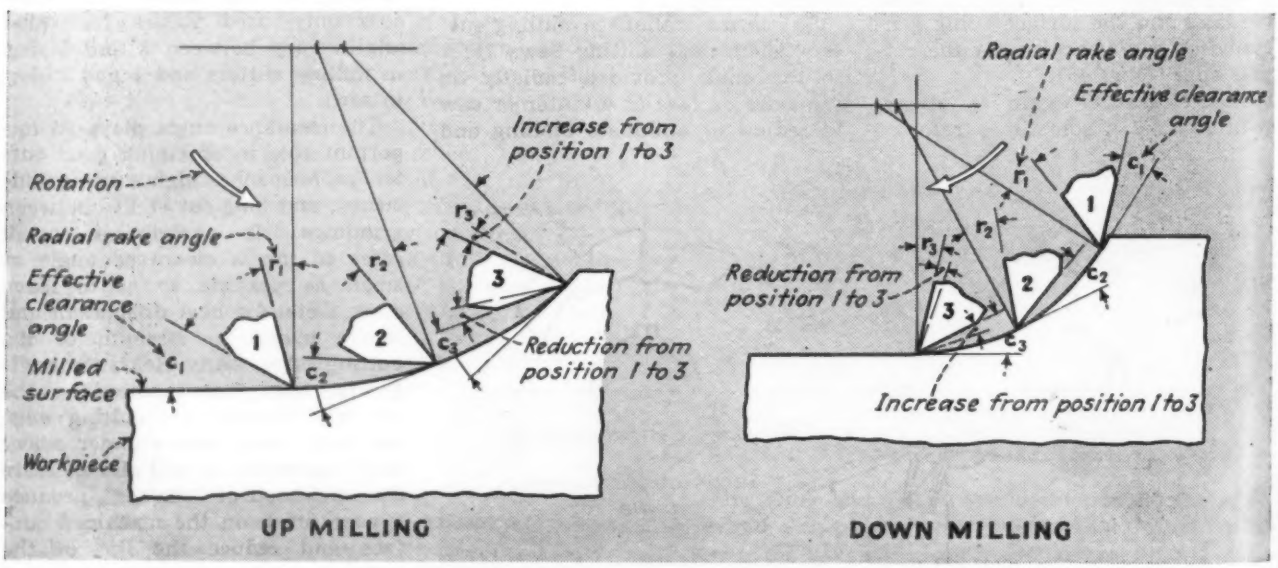
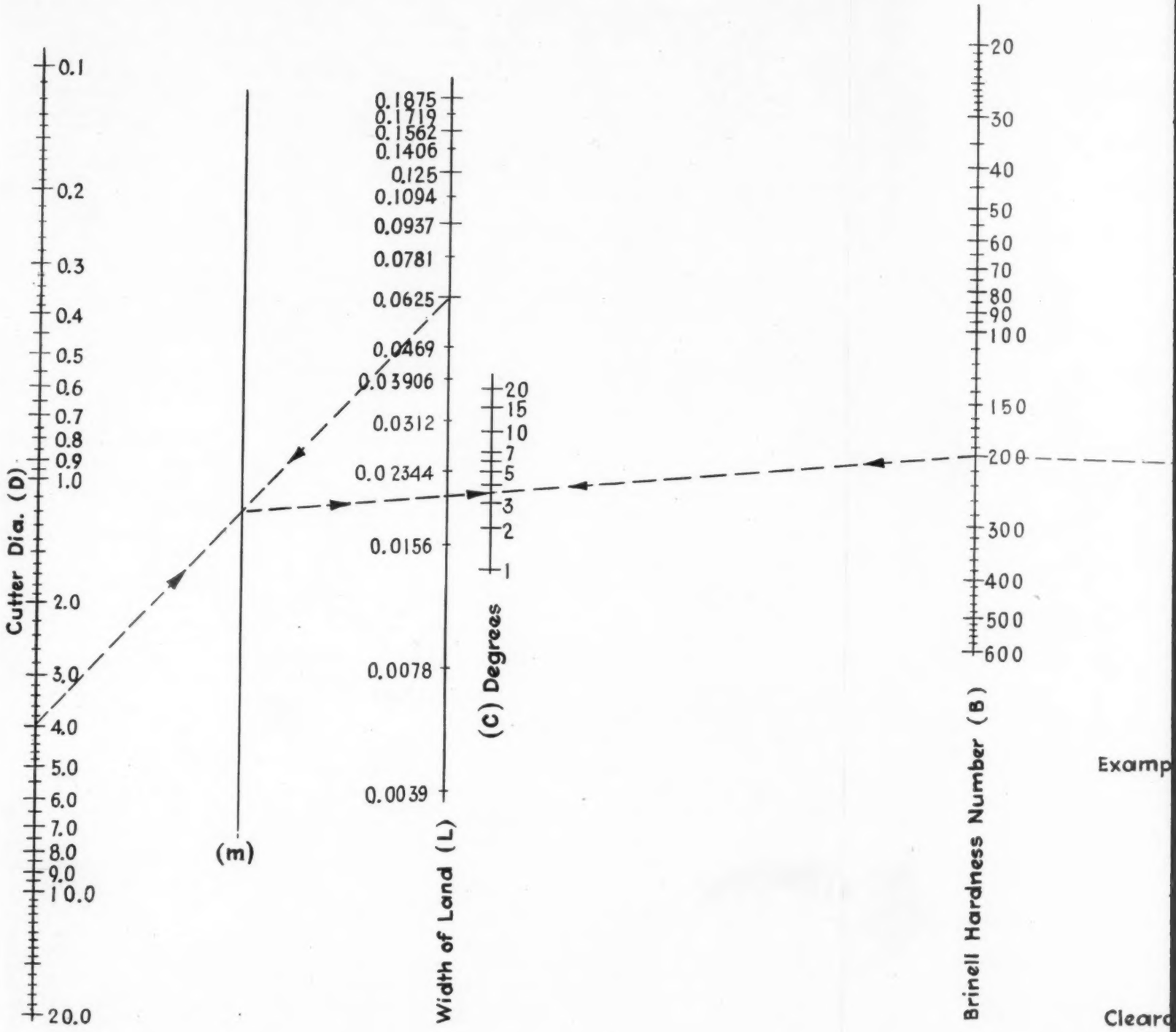
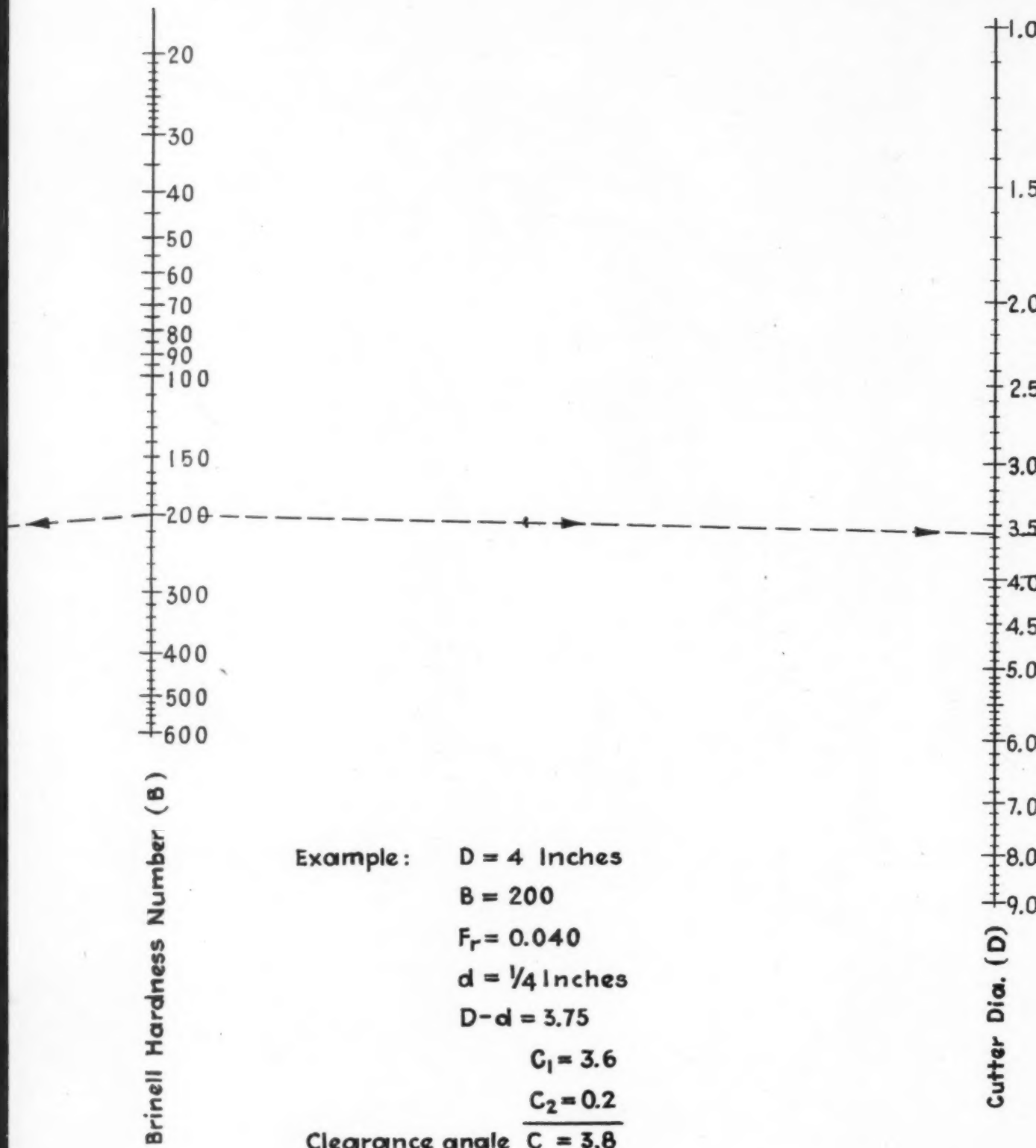


Fig. 43—With up milling, the effective clearance angle decreases as the cutter tooth progresses. In down milling the reverse is true



Beginning on the left hand side of the chart, draw a straight line from point 4 on scale *D* to point 0.0625 on scale *L*. Connect point of intersection of this line with index line *m* to point 200 on the *B* scale. This line intersects vertical line c_1 at a point reading approximately 3.6 deg. Now beginning on the right hand side of the chart draw a line from point 0.040 on the F_r scale to point 0.250 on the *d* scale. Connect point of intersection of this line with the vertical line *n* to point 3¾ on the *D-d* scale. Then connect the intersection on the *O* line with point 4 on *D* scale. This line inte sects vertical line *p*. Connect point of inte section on line *p* with point 200 on B scale. Th line crosses vertical line c_2 at a point readi close to 0.2 of deg. Add 3.6 and 0.2 to obta the total clearance angle 3.8 deg.



Example: D = 4 Inches

B = 200

F_r = 0.040

d = 1/4 Inches

D-d = 3.75

C_1 = 3.6

C_2 = 0.2

Clearance angle C = 3.8

ine with point 4 on *D* scale. This line inter-
s vertical line *p*. Connect point of inter-
ion on line *p* with point 200 on B scale. This
crosses vertical line c_2 at a point reading
e to 0.2 of deg. Add 3.6 and 0.2 to obtain
total clearance angle 3.8 deg.

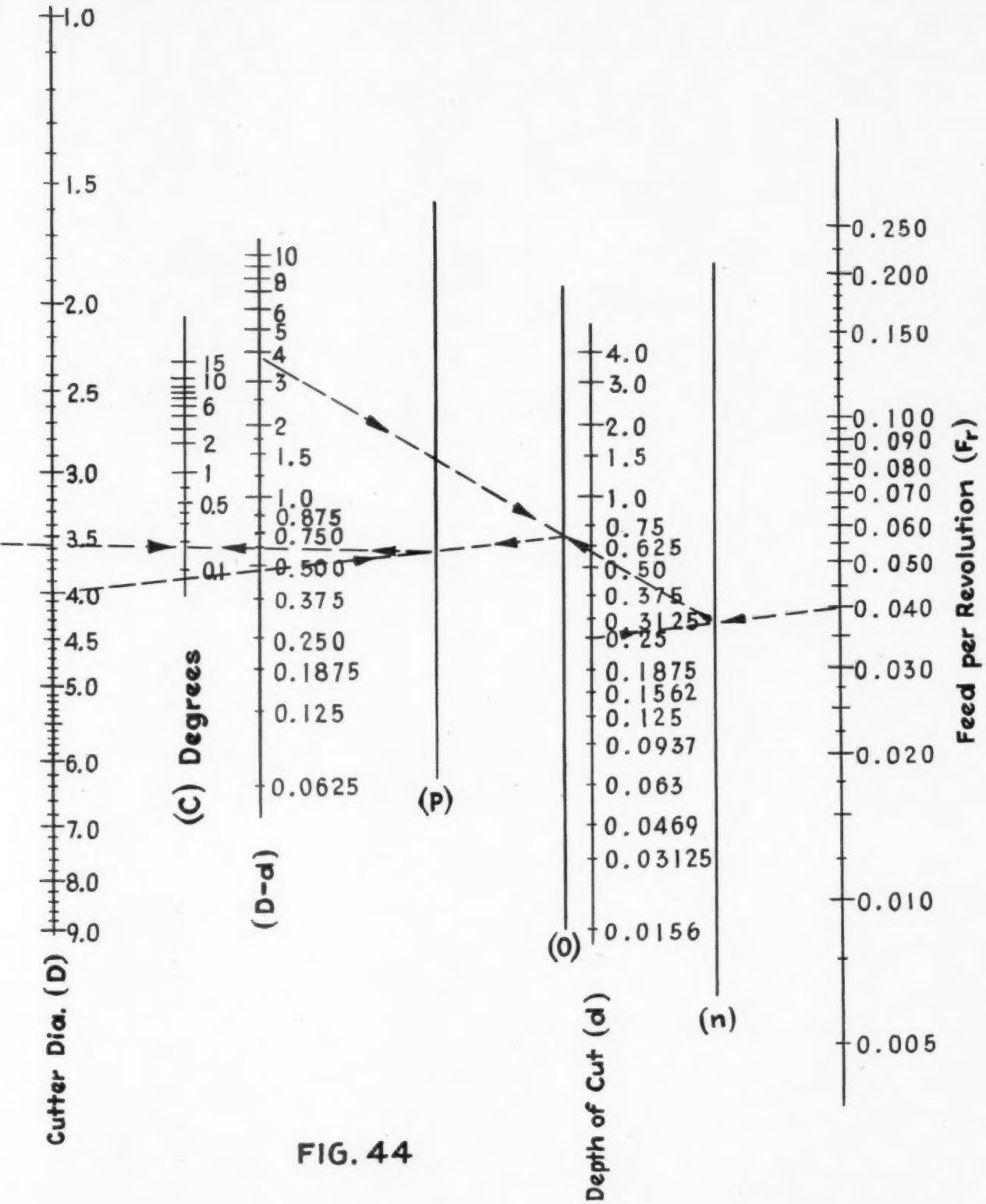


FIG. 44

ALIGNMENT CHART FOR DETERMINING THE CLEARANCE ANGLE OF MILLING CUTTERS

L = Land width, in.
d = Depth of cut, in.
F_r = Feed per revolution, in., and
B = Brinell hardness number of metal cut.

This formula can be used to calculate the clearance angle for plain milling cutters, face mills and form cutters.

The following example shows the application of Formula 7. Example: Calculate the clearance angle for a 4 inch diameter 8 tooth milling cutter. The teeth to have 1/16 in. width of land. The operating conditions are: Feed per revolution (F_r) 0.040 in., depth of cut (d) ¼ in., Brinell hardness number (B) 200.

Substituting these values in Formula 7:

$$C = \frac{45860}{4 \times 200}\left[\frac{1}{16} + \frac{0.04}{3.14 \times 4\sqrt{0.9375}}\right] = 3\tfrac{3}{4} \text{ deg.}$$

Use of Alignment Chart

The clearance angle for any given operating condition can be readily obtained from the alignment chart (Fig. 44), by adding the value C_1 obtained by proceeding from the left and the value C_2 obtained by proceeding from the right as shown in the example indicated in Fig. 44.

The value C_1 corresponds to the given value of land L, cutter diameter D and brinell hardness B while the value C_2 is the additional amount of clearance resulting from the feed per revolution F_r, depth of cut d, cutter diameter D and brinell hardness B.

Number of Teeth and Chip Space

The teeth of a milling cutter are equally spaced and project from the body of the cutter either radially, as in helical mills, or both radially and axially, as in face mills. The teeth may either be an integral part of the cutter or be inserted in the body in the form of inserts or blades.

The *root* of a tooth in solid tooth milling cutters is the section where the tooth emerges from the body of the cutter. The front of the tooth is termed the *face*, while the rear is known as the *flank* or *back*.

The space between the face and the back of a tooth is the *chip space*. It is larger in heavy duty cutters having fewer teeth, and smaller in light duty cutters with a greater number of teeth. In end mills and helical mills, this space is also termed *flute*.

For a given cutter diameter the number of teeth and the size of the chip space are directly related. A large number of teeth will reduce the amount of chip space available, and conversely, a large chip space will necessitate a smaller number of teeth. In the consideration of chip space, two factors are required for good cutter performance:

1. A *correctly shaped* chip space.
2. A *sufficiently large* chip space to permit free flow of chips.

Narrow pockets and sharp corners should be avoided. A rounding or "gullet" of large radius at the root of the tooth and a wide angle between the teeth will permit unobstructed escape of the chips, thus preventing clogging or wedging. The advantage of a large chip space is most pronounced when a continuous curly chip is produced, as in the milling of ductile material.

No standard rule exists for the number of teeth in milling cutters. The number of teeth in standard milling cutters as offered by cutter manufacturers has been found to be not as satisfactory for most purposes as the smaller number of teeth in heavy duty or "coarse tooth" cutters, and the number of teeth in standard cutters is therefore often reduced in the shop by grinding every other tooth low, in order to improve the performance and cutting efficiency of the cutter. This is found especially desirable in difficult jobs where "chatter" may develop in the operation of the cutter.

The so-called "coarse tooth" milling cutter allows each tooth to cut a chip of substantial thickness rather than to skip over the surface of the work. It also provides a chip space large enough to accommodate long chips and thus permits a freer flow of the chips than the fine tooth, light duty type cutter.

In metal-slitting saws, the number of teeth varies according to the type of operation performed. When the requirements are not severe, the number of teeth in the ordinary type of slitting saw is satisfactory. Coarser tooth saws having side teeth for chip clearance, as in side mills, are used when cutting deep slots in alloy steel.

Saws with finely pitched teeth should be used for cutting thin materials. The cutting action should preferably be such that more than one tooth is in contact with the work at a given time, helping to eliminate vibration and prevent "hogging" into the work.

Special formed saws, with the teeth ground as in form cutters, are used for slitting copper and other soft non-ferrous materials. The teeth are alternately flat and V-shaped, or have the corners chamfered. The V-shaped teeth split the chips formed by the flat teeth, thus eliminating the tendency to drag in soft material.

These saws have the sides ground concave for clearance. A generous chip space and well-rounded gullets are provided to eliminate packing of chips between the teeth. Because the teeth are formed, they are sharpened on the face in the same manner as form cutters, thus preserving the original profile.

Form high-speed steel cutters are made with coarse tooth spacing because it is necessary to have a tooth of sufficient depth of thickness to provide for a large number of resharpenings before the cutter is used up.

In high-speed milling with sintered carbide cutting material, the number of teeth can be calculated by means of the following formula. This permits full utilization of the power available at the cutter and prevents overloading the motor driving the machine, for given values of the feed per tooth, depth and width of cut.

$$T = \frac{K \cdot Hp.}{f \times N \times d \times w} \qquad (8)$$

where:

T = number of teeth,
K = constant which may be taken equal to 0.650 for average steel, 1.5 for cast iron and 2.5 for aluminum. (These are conservative values which take into consideration the dulling of the cutter in service.)
$Hp.$ = Horsepower available at the cutter,
f = feed per tooth, inches,
N = revolutions per min.,
d = depth of cut, in.,
w = width of cut, in.

Example: To determine the num-

TABLE V—ACCEPTED CLEARANCE ANGLES FOR MILLING CUTTERS USED ON VARIOUS WORK MATERIALS

Material to be cut	Clearance angle In degrees
Low Carbon Steel	3-5
High Carbon and Alloy Steels	
Cast Iron	4-7
Soft Brass and Bronze	10-12
Medium and Hard Bronze	4-7
Aluminum, Magnesium, Plastics, Etc.	10-12

ber of teeth in a face mill for high-speed milling 200 brinell alloy steel, under the following conditions:

Cutter diameter = 8 in.
Width of cut (w) = 6 in.
Depth of cut (d) = ⅛ in.
Cutting speed = 570 ft. per min.
Revolutions per minute =

$$N = \frac{570 \times 12}{8} = 272$$

Feed per tooth f = 0.008 in.
Horsepower available at the cutter Hp. = 10 K = 0.650

Substituting these values in the above formula:

$$T = \frac{0.65 \times 10}{0.008 \times 272 \times \frac{1}{8} \times 6} = \text{appx. } 4$$

Formula 8 can be used also for calculating the number of teeth in milling cutters of high speed steel or cast tool cutting material.

In general, the number of teeth in a milling cutter should be selected on the basis of an all around good performance. A rule which has been found to give satisfactory cutter performance, strong tooth section, ample chip space, economy in cost and maintenance and good cutting efficiency and yet assure a continuous cutting action is to provide the cutter with a number of teeth so that not more than two teeth are engaged in the cut at any time.

On this basis the following formula can be used for obtaining the number of teeth in face milling cutters:

$$T = \frac{\pi \cdot D \cdot n}{W} \qquad (9)$$

where:

T = number of teeth in the cutter,
D = cutter diameter, in.,
n = number of teeth in contact,
W = width of cut, in.

Example: Determine the number of teeth in a 6 inch diameter face mill. The width of cut is 4 inches and the number of teeth in contact at any time is 2:

$$T = \frac{3.14 \times 6 \times 2}{4} = \text{appx. } 10$$

In the case of *peripheral milling cutters*, the following formula applies.

$$T = \frac{4 \cdot \pi \cdot D}{D + 4d} \cos a \qquad (10)$$

where:

T = number of teeth,
D = cutter diameter, in.,
d = depth of cut, in.,
a = helix angle, deg.

Example I: Determine the number of teeth in a 4 in. diameter helical mill, having a helix angle of 70 deg. and the depth of cut is ¼. Substituting these values in Formula 10:

$$T = \frac{4 \times 3.14 \times 4}{4 + 4 \times \frac{1}{4}} \cos 70 = \text{appx. } 3$$

Example II: Same cutter, but the helix angle is 25 degrees:

$$T = \frac{12.56}{1.25} \cos 25 = \text{appx. } 10$$

If the depth of cut is ½ in., the number of teeth would be reduced to approximately 8.

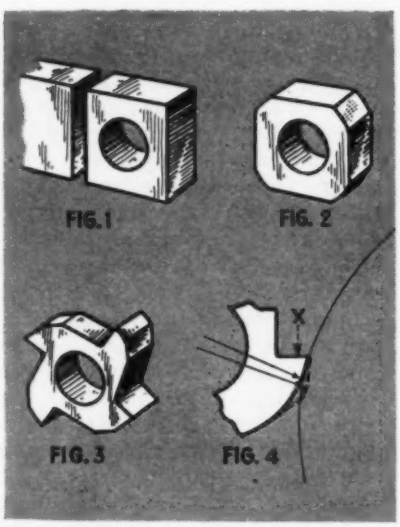
The ninth installment of Mr. Martellotti's series on care and sharpening of milling cutters will appear in an early number.

Forming Four-Tooth High-Speed Milling Cutters

BY ROSS A. SCHULTZ,
NOBLETT & FOREST, WOODVILLE, SOUTH AUSTRALIA

THE RECENT ARTICLE by Arthur A. Schwartz on decreasing machining time by reducing the number of teeth of milling cutters is very much in line with my own experience. With a four-tooth cutter of my own manufacture it was possible to double both feed and speed and obtain a quicker removal of metal, several times longer cutter life, better finish and with less vibration as compared with the results obtained with a regulation cutter at ordinary feeds and speeds.

The cutters are made by cutting off a piece of flat stock high-speed steel, as shown in Fig. 1. A hole 1 in. in diameter is bored for the arbor of the miller, as shown in Fig. 1, and the sides are ground or machined parallel. The four corners of Fig. 2 are formed on a lathe. The part is then held in a shaper vise and the cutting edge of the teeth rough-machined, as shown in Fig. 3, and the part need not be indexed accurately. After a keyway is cut, if one is required, the part is hardened by guesswork, with an oxy-acetylene flame.



Four-teeth milling cutters at unusually high speeds remove metal faster than cutters at normal speeds

The final step is to provide relief for the teeth, which is done on an old tool and cutter grinder. In the case of radius cutters a truing attachment is used and more material is backed off than is true generally in such cases. The face, *X* of Fig. 4, is ground by hand and the cutter is rolled past the stone until the face has a knifelike edge. The position of the wheel is set by trial and error. This method is used to avoid the necessity of indexing the position of the four teeth when shaping them. Accurate forms are obtained by these methods, but involutes are more difficult. They are treated in the same way, except that the stone is trued to a gage and each tooth formed in two operations. Other forms are usually obtained without difficulty.

Practical Ideas

War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production

Modified Chuck Insures Accurate Centers on Propeller Shafts

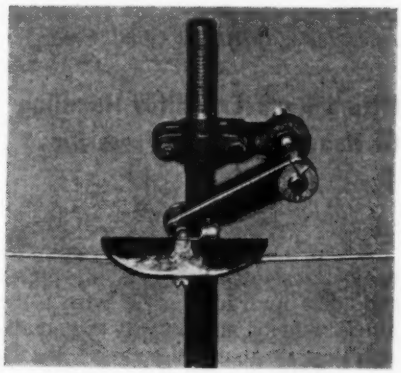
BY JOHN GLOSKEY
Packard Motor Car Company

Conversion of a standard three-jaw chuck, for grinding locating centers on heavy propeller shafts, by replacing two of the jaws with a half-round collar, eliminated considerable alignment time and production was doubled in a ten-hour day. A standard chuck, an aligning bar and an indicator were used formerly to set up the machine.

The chuck, with two of the jaws replaced with the collar, is shown in the illustration on the left. On the right is shown the propeller shaft located in the machine.

When performing this grinding operation with the original chuck, it was necessary to check alignment of the machine an average of five times a day. Due to the weight of the part, extreme care was necessary when handling it, as the slightest jar would change the position of the jaws, necessitating realignment of the chuck. Accuracy was necessary as the part is located between centers when the remaining operations are performed. The half-round collar was ground to size while in position.

The time consumed formerly for realigning the machine, as well as the repair work, due to out-of-round centers, has been eliminated, and production has been increased from 25 to 50 pieces in ten hours. This type of chuck is also used to grind the center in the opposite end of this part, increasing production. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

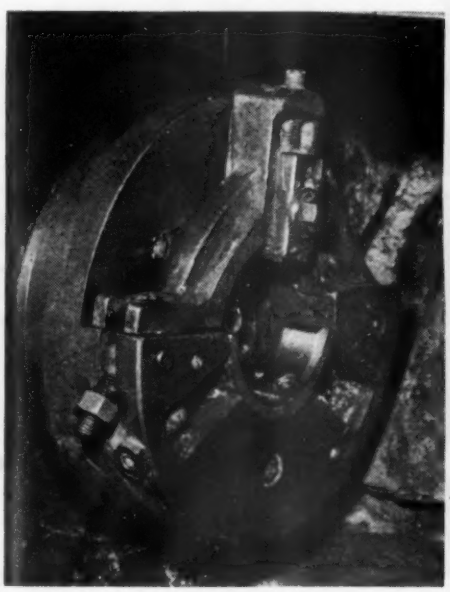


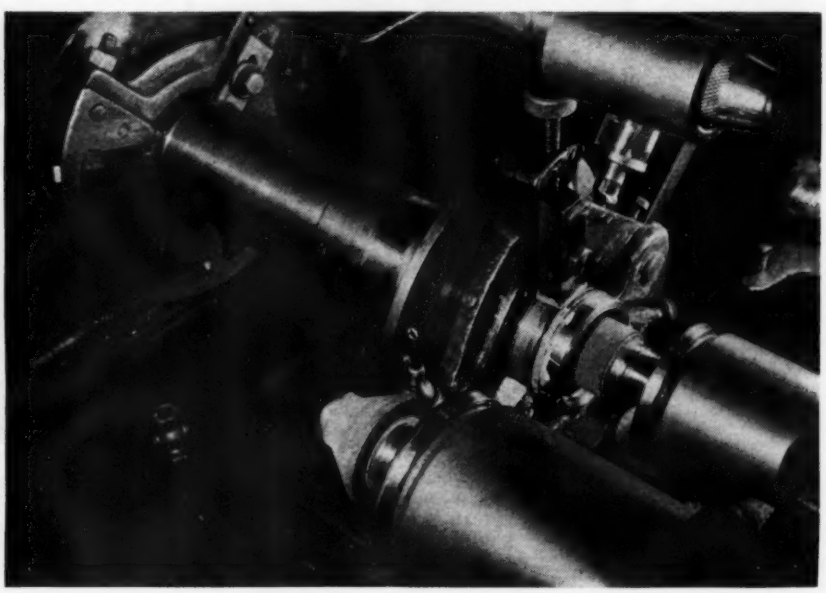
A soft-iron, self-aligning trolley shoe reduces wear of shoe and wire, avoiding high maintenance charges

Wear Reduced by a Self-Adjusting Trolley Shoe

BY ALLEN R. SHEA
Permanente Metals Corporation, Shipyard No. 2, Richmond, Calif.

Only too often, the trolley wire for bridge cranes sags so much that adjustment of the shoe to accom-





Greater accuracy was obtained in grinding locating centers on heavy propeller shafts by replacing two of the three chuck jaws and substituting a half-round collar

modate one level causes binding at another position. The wear on the shoe and wire is also excessive.

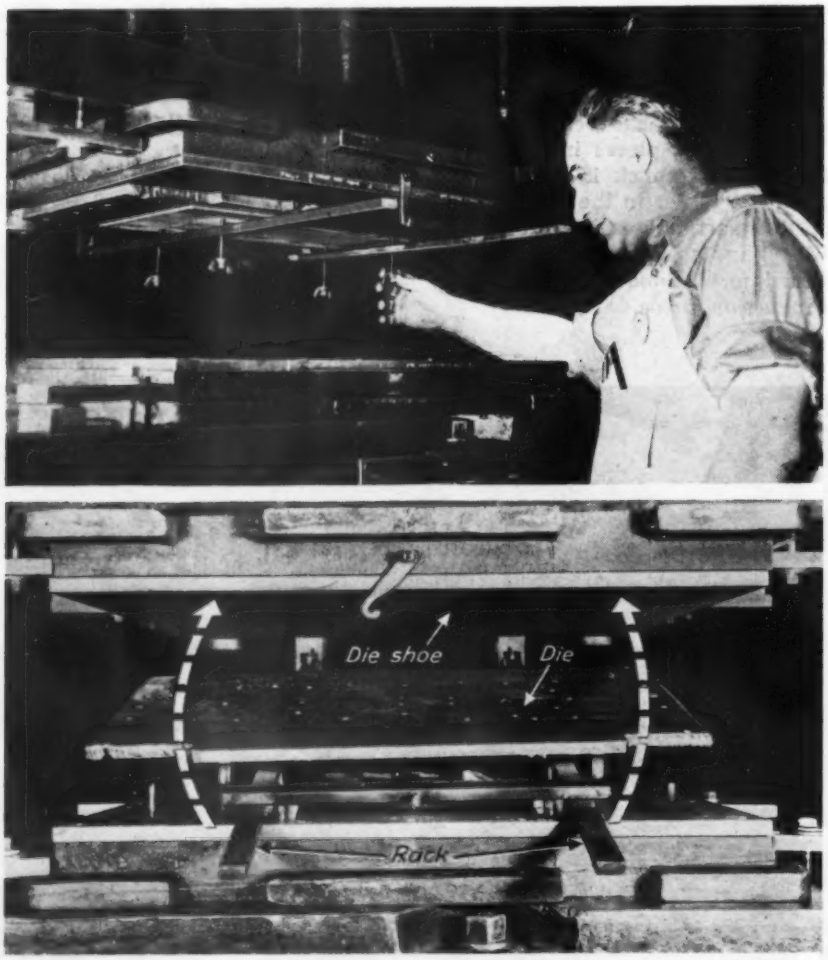
To compensate for these conditions, a soft iron shoe is loosely attached to a floating lever connected to the trolley pole. With this arrangement, inequalities of the trolley wire can be compensated and wear of the wire and shoes reduced materially. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Lifting Rack Expedites Handling Of Heavy Hydraulic Press Dies

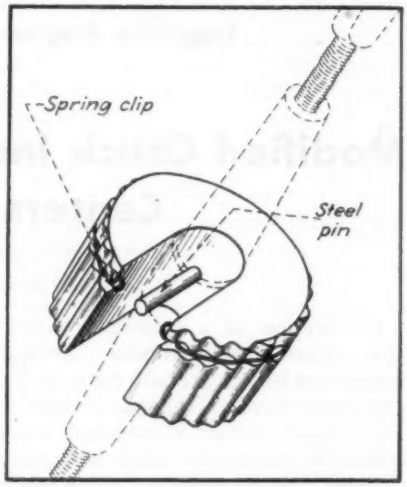
BY LESTER W. MITCHELL
Curtiss-Wright Corporation, St. Louis

It was necessary formerly to place heavy dies in position on the upper shoe of a hydraulic press with a lift truck, which was not always available, or by manual means. In the latter case blocks of wood were built up to the correct height and the dies were lifted by two men and placed in position on the blocks. The ram of the press was then lowered until the locating pins were in position, so that the die could be bolted in place. It was a tedious and somewhat dangerous method.

A rack was designed for handling the dies. It is made of metal hinges in slots at the back of the machine, slightly below the level of the bottom of the upper die shoe. The forward part of the rack lies on the bed of the press. The die is placed on the rack and the front of the rack lifted and hooked to the ram of the press, where it is placed directly under the positioning pins. The vertical wingbolts of the rack are then turned until the die has been located over the positioning pins. Retaining bolts are then inserted to hold the die in position. Use of the rack saves 416 hours a year and eliminates the injury hazard. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Heavy dies are lifted to the upper shoe of a hydraulic press by a rack, after which wingbolts are used to push the die into place over the positioning pins



A spring clip snaps over the turnbuckle to hold it and the pin fits the turnbuckle hole for adjustment

Slip-On Turnbuckle Tightener Helps in Cramped Spaces

BY PAUL SCHREINER
Glenn L. Martin-Nebraska Co.

Cramped spaces are prevalent, clearances limited, equipment crowded in airplanes, all of which makes adjustments of control-cable turnbuckles a ticklish problem.

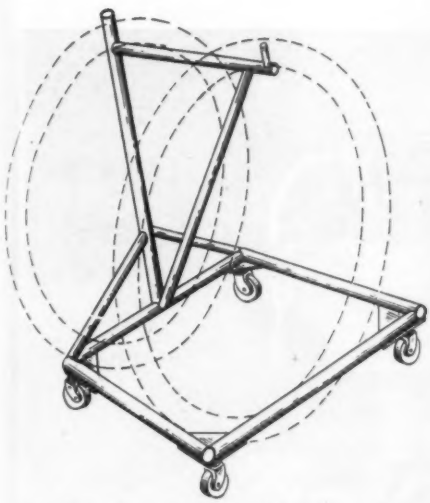
A plastic-fiber turn barrel was made which was capable of fitting the customary sizes of turnbuckle. It was found to be especially useful in close quarters, reducing the time to a fourth of that previously required.

Nails, punches, pliers used previously, had a habit of dropping into small recesses from which they were difficult to remove. *War Winning Suggestion from Board for Individual Awards, War Production Drive.*

Shop Truck With Overarm Transports Rings Without Damage

BY WAYNE M. GAUMER
Glenn L. Martin-Nebraska Co.

Ring-shaped articles have long been a transportation problem in the shop, especially when many opera-



Made of welded tubing or bar stock, this dolly prevents hollow shapes from falling upon the floor

tions must be performed on each piece.

To prevent piling and much rehandling, with probable damage and rejection, a dolly can be used to advantage. This is made of tubing or angles welded together, with an overhanging arm for supporting the circular shapes, and is mounted on substantial casters.

The dolly can be placed close to the machine for convenient loading, wheeled to the next machine for additional work, then pushed along the line for other operations. Floorspace is saved, rehandling is minimized, operations are speeded. *War Winning Suggestions from the Board of Individual Awards, War Production Drive.*

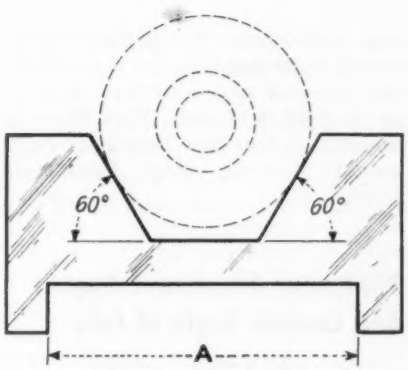
V-Block Reduces Time of Cutting Keyways in Round Stock

BY DONALD R. TRYER

When using a shaper to cut internal keyways in a large quantity of hub-castings, the V-block shown greatly reduced the time required and eliminated necessity for repeated adjustment of the shaper table for each casting. The black is of mild steel and the dimension *A* is of correct length to insure a snug fit of the block over the ways of the shaper vise.

The dotted circles indicate a round piece of stock in position in the block. The thickness of the block is slightly less than the thickness of the workpiece and the sloped sides of the block are at an angle of 60 deg.

The castings were first faced, then turned and bored. After the first casting has been correctly positioned for cutting the keyway the rest of the run settles automatically into the same position. Any misalignment is corrected by a few taps of a hammer. Machining time on 80 castings was cut from nine hours to three hours.



Use of a 60-deg. V-block in cutting keyways in round stock eliminated adjustment of the shaper table for each workpiece

Portable Grinding Device Resurfaces Hoist Drums in Place

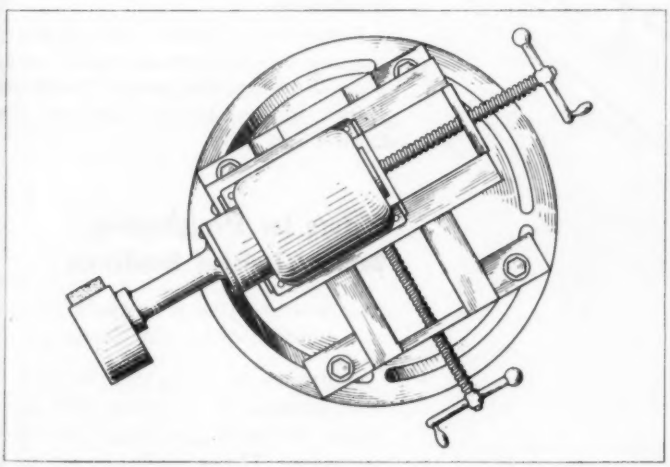
BY ROY C. NORDSTROM
Marinship Corporation, Sausalito, Calif.

Refinishing the brake drum surface of hoists can be accomplished without dismantling, and in about a tenth of the usual time, by the use of a motor-driven grinder attached to a compound rest and supported by a disk or table. The assembly is neither large nor heavy; it is portable and can be set up quickly. This combination has proved to be an economical tool for such service. On one job which formerly took four men three eight-hour shifts to do the work, this device enabled one man to complete the task in four hours.

Because each set-up has individual characteristics, the method of mounting must be improvised on the spot—it may be necessary to use timbers or strap the outfit to a part of the machinery.

Because of its flexibility of operation, the treads of wheels, the grooves of sheaves, or various contact surfaces can be reconditioned

The disk or table is slotted so that the grinder and compound can be shifted to a favorable position. The handles on the feed screws move the grinder into position



in a short time. The grinder is universal in its application; it can handle internal and external, tapered or straight surfaces. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Pin Router Attachment Gages And Controls Depth of Cuts

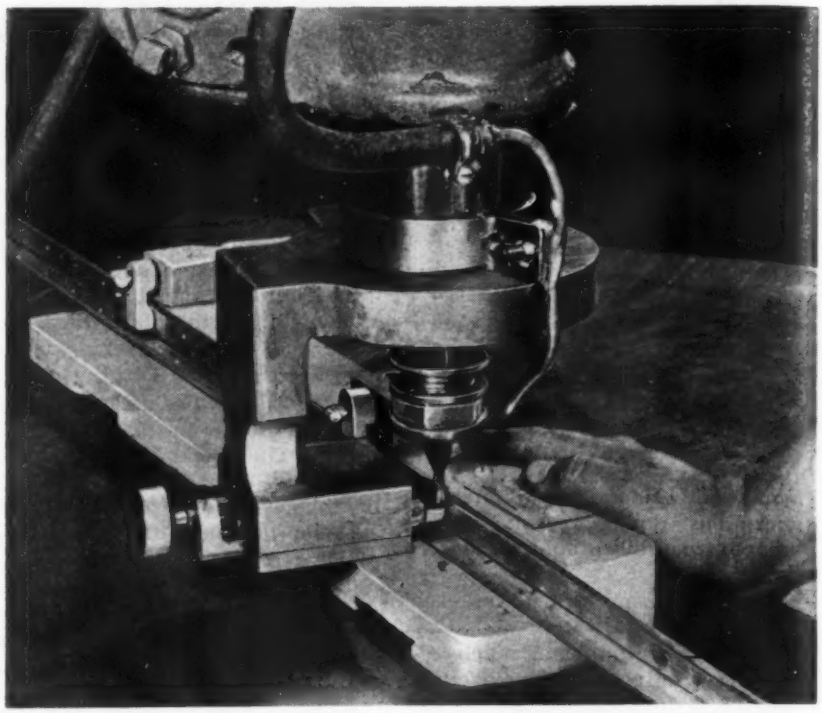
BY MICHAEL HEBREK
Woodall Industries, Inc., Detroit

A pin router attachment that automatically gages the depth of cut when routing extruded bulb sections has replaced the former jig method, which was unsatisfactory because the depth of cut could not be controlled.

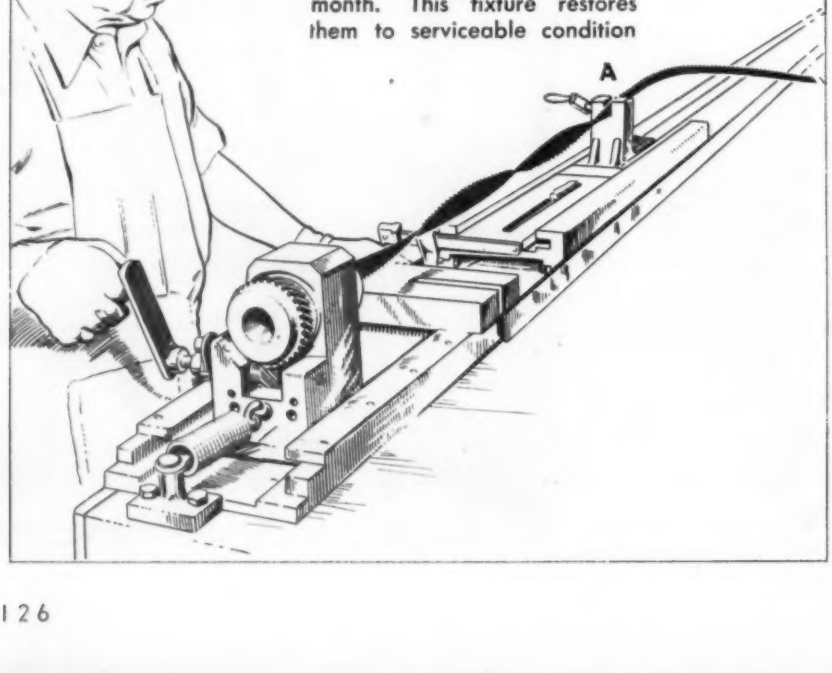
The jig used formerly held bulb extrusions in a positive position in relation to a plate on the bottom of the jig, which had the necessary templet cutouts. The jig followed the exact diameter of the pin, which protruded above the surface of the router table and was directly below the cutter and concentric with it. Stock thickness of the extrusions varied, which caused a difference in the depth of the cut. To compensate for a difference in the diameter of cutters after sharpening, various sized follower or guide pins were required to match them. However, routing wasn't always accurate, as any variation between pin, plate, cutter and stock thickness caused scrap.

As a result, a jig is now used to hold parts in position while routing. The plate on the bottom of the jig is used only for running out cutouts, but does not control the depth of cut. The pin router attachment is set to the outside diameter of the cutter by means of an adjusting screw, which gives the operator micromatic control of the relationship of guide to cutter. With the new method the guide is brought into position by the adjusting screw and the stock is fed against the guide. All cuts are in direct relation to the face of the stock. When tools are changed the guide is checked for alignment.

Performance shows time saved in making set-ups and negligible scrap. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Difficulty in controlling the depth of cut brought about development of a pin router attachment which automatically controls the depth of cut regardless of variations in the thickness of parts

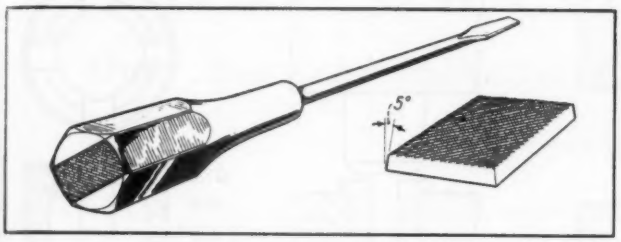


About 100 twisted or bent bandsaws were scrapped each month. This fixture restores them to serviceable condition

Fixture for Straightening Bent or Twisted Bandsaws

BY JOHN SPENCER AND CHARLES NASS
Packard Motor Car Company

A fixture to straighten twisted or bent bandsaws is saving 1200 man-hours of work per year for other purposes. These bandsaws are made



An ordinary screwdriver can be converted into a double-purpose production tool by inserting a piece of a file in the handle

of spring carbon steel. They become twisted and bent with use and when this occurs the saws become dull much faster than normally and will not give a smooth or straight-line cut.

These saws were straightened formerly by two men, one of whom stood on the saws, while the other twisted them in both directions until all twists or bends had been removed. The average time required was 35 min. About 200 saws must be straightened and resharpened monthly. About half of them were scrapped as many of them could not be straightened by the means employed.

Part *A* of the fixture is adjustable, so that any section of the saw can be straightened. Any desired pressure can be applied by means of the crank on the gearbox. One man now straightens the saws in the average time of five minutes per saw.

The average life of a saw under ordinary conditions is 20 resharpenings, so that under former conditions some of the saws were scrapped with from one to 19 resharpenings still available. Since the new fixture has been in use the scrapping of saws because of inability to straighten them has been practically eliminated. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Burrs on Screwheads Removed by Modified Screwdriver

BY DANIEL E. McDONALD

A screwdriver, with a section of a file inserted in the end of the handle, saves a lot of time in removing burrs from screw slots. This is particularly true when making small electrical and mechanical assemblies. Without such a tool an operator must lay down the screwdriver, pick up a file or hunt for one, remove the burr, lay down the file and then pick up the screwdriver. The motions required to remove the burr are minimized by this screwdriver, which is merely reversed in the hand.

A section of a file, with the sides ground at an angle of 5 deg., to form a dovetail, is driven into a slot machined across the end of the file handle. The narrowest width of the file equals the width of slot in the handle. The dovetail on the file cuts its way into the body of the handle, keying the file in place. Length of the file depends upon the size and shape of the screwdriver handle. Sharp corners on the file are removed by grinding or stoning.

Boring Bars Interchanged Without Disturbing the Toolholder

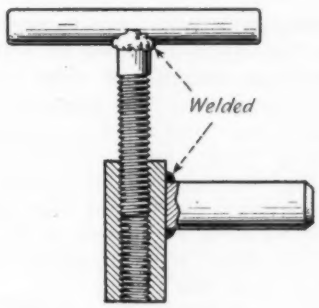
BY JAMES NELSON

A toolholder that allows interchange of boring bars as often as desired, without disturbing the position of the holder with respect to the work, is shown in the illustration.

The holder is drilled to accommodate any number of bushings the outside diameters of which correspond to the size of the hole in the holder. A small pin that fits a notch on the flange of the bushings holds them in place.

The bushings are bored to have an inside diameter slightly larger than the diameters of the various sizes of boring bars with which they are to be used and are also slotted to allow compression by a square-headed clamping screw, which holds the bushings in place between the jaws of the holder.

When several sizes of boring bars are required for a job the jaws of the holder are loosened, the tool and bushing removed and another tool and bushing inserted, without disturbing the position of the holder. These boring bars and bushings can be used also on a drill press by inserting the bushings in the chuck. All bushings and the clamping bolt are casehardened.

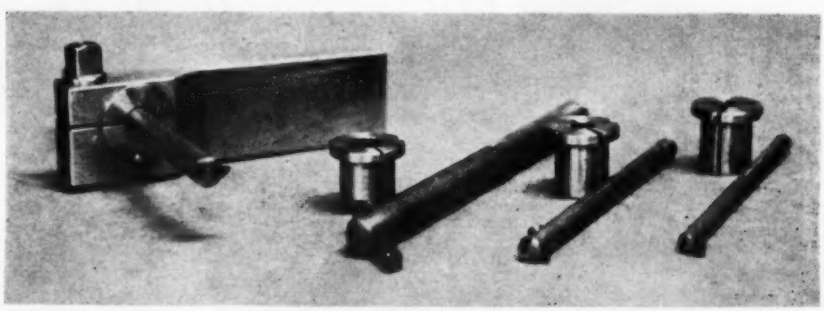


Spoiled work is avoided, and assembly operations are speeded, by making a two-part extractor for small studs

Tool for Setting Small Studs Works in Close Quarters

BY ALLEN O. NEWSOM
Naval Air Station, Corpus Christi

To prevent damage to small studs, especially when working in close quarters, a two-piece tool has proved useful. One piece consists of a tapped sleeve brazed to a short handle; the other piece is a T-handled lockscrew formed by brazing a stud to a short length of drill rod. After the sleeve is run onto the stud to be set or ex-



Boring bars of various sizes can be used interchangeably in this toolholder without disturbing the position of the holder with respect to the work

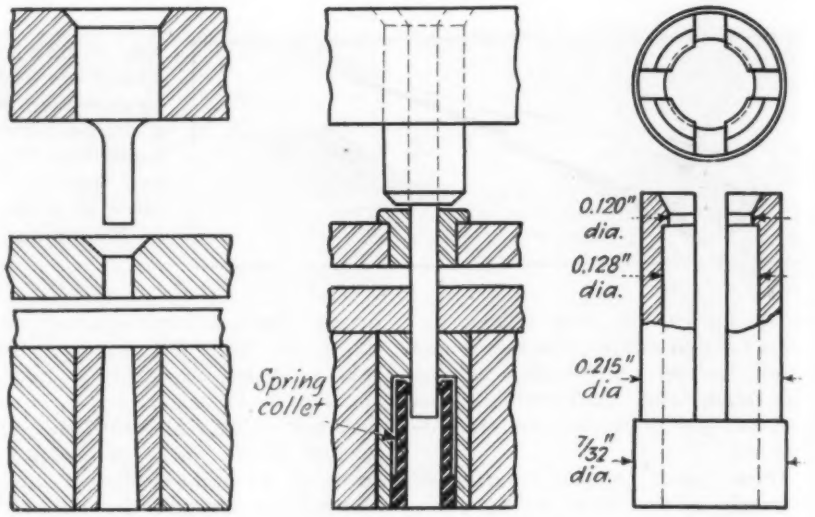
tracted, the lockscrew is tightened into the sleeve until it jams on top of the stud. Then the sleeve's handle is turned in the proper direction. Use of a sleeve has these advantages: first, it will operate in small space; second, it is sufficiently long to obtain a good bearing on the stud and avoid damage to the threads. The handle should be kept short. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*

Spring Collet Used in Die to Hold Down Pierced Slugs

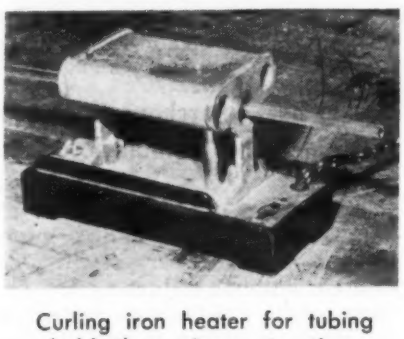
BY H. R. HAGEMAN

Difficulty was experienced in piercing 0.015 in. holes in 3/16 in. aluminum because of slugs lifting with the punch. The punches were made longer and the face ground at various shear angles without overcoming the trouble. Reducing the punch clearance did not help. However, by using a four-jaw spring collet, the slugs were prevented from lifting with the punch.

Originally the tool was built as at *A* in the illustration. The final design is shown at *B*, and an enlargement of the spring collet is seen at *C*. Each punch (there are 14 in the die) is made long enough to punch the slug through the four jaws of the collet. On the upstroke the slug is gripped by the collet. Punch clearance is 0.010 in. on the diameter.



Use of a four-jaw spring collet in a piercing operation prevented aluminum slugs from rising with the punch and also eliminated punch breakage

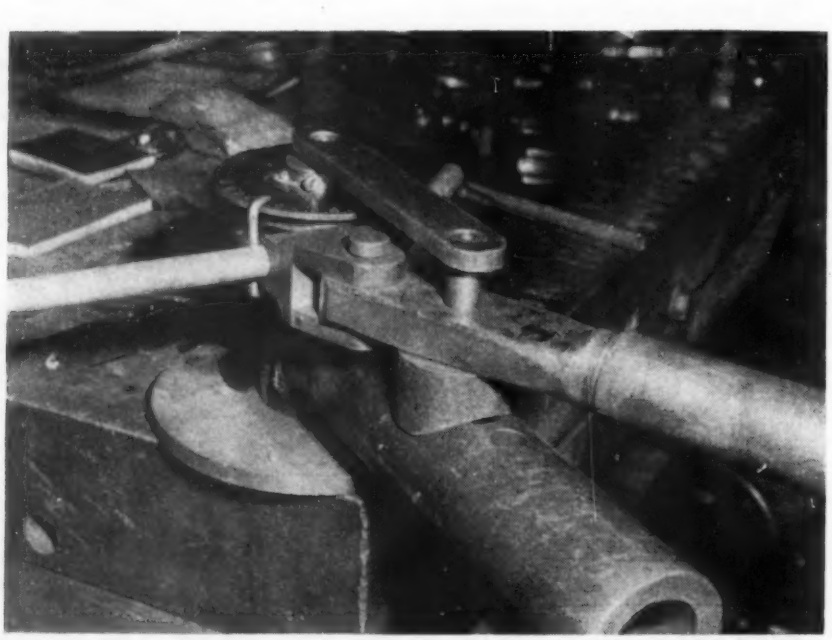


Curling iron heater for tubing holds three pieces at a time

Electric Heater Softens Plastic Tubing

BY RAY O. WOLF
Glenn L. Martin-Nebraska Company

An electric curling iron heater is the means for uniformly heating polystyrene tubing prior to making bends. It has three openings about one inch in diameter by several inches long. The evenly distributed heat softens the plastic and avoids the troubles experienced when other methods are tried. *War Winning Suggestion from the Board of Individual Awards, War Production Drive.*



Pipe bent to indicator makes allowance for spring back

Pipe Bending Indicator Eliminates Cut and Try Methods

BY LEO LOVE
California Shipbuilding Corporation
Wilmington, Calif.

Pipe bends to exact angles require considerable trial and error fitting, even when templets are handy.

If a disk can be mounted on the bender and an indicator fastened to the movable arm, pipe can be bent to close tolerances. This disk can be marked like a protractor or a series of divisions can be used.

This addition is a time saver, when bent pieces are made in large quantities. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

AMERICA WANTS COMPETITION

Only American Initiative Can Preserve It in World Trade

AMERICANS generally agree upon what constitutes a desirable pattern of international economic relationships. We want an expanding world trade, with minimum recourse to government-imposed trade barriers and discriminatory trading arrangements, and offering ample scope for competitive private enterprise. Because they are necessary to such trade, we want also stability of exchange rates, and national currencies that are mutually convertible at least for the settlement of current accounts. We want, too, arrangements to facilitate long-term capital loans with security to the lender and advantage to the borrower.

Few other nations subscribe to these aims with enthusiastic conviction. Some reject them flatly as impractical under the conditions likely to prevail during the postwar period, or achievable only at prohibitive cost to their domestic economies.

Unless, therefore, we can formulate a practical and comprehensive program to carry out our aims, and convince other nations that we will take a sustained and responsible part in making it effective, the international trade of the world surely will be conducted under a system of exchange controls, bilateral agreements, cartel bargains, import quotas, and direct government purchasing arrangements that are the very antithesis of the competitive system that we favor.

To agree upon a concrete American **program,** and to convince other nations that it is to their advantage as well as ours to accept it, is a major task of economic statesmanship. It entails reversing a trend which has persisted since World War I, and which has been intensified during the depression years of the nineteen-thirties and by the exigencies of World War II.

Clearly, that is not a task to be assumed lightly. We can hope to be successful only if (1) we have a deep conviction that what we seek is fundamentally important to the American interest, and (2) if we will take pains to understand why other nations fear that such a program may jeopardize their interests, and then make whatever accommodations may be necessary to resolve their doubts.

An expansive foreign trade policy has been advocated so vigorously and repeatedly in America recently that The Economist (of London) comments wryly upon what it terms the ironic circumstance that "the acceptance of the principles of free trade by the more literate (American) public should come at a time when the doctrines in their simplest nineteenth-century form have been pretty generally emasculated in fact and repudiated in principle by the rest of the world".

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Why are we opposed to managed world trade, and for competitive world trade?

First, we are against rigged and managed international markets because we know that successful participation necessitates a comparable degree of control over the domestic economy as well. There is little debate of this fact, and those nations which accept a managed external trade as a necessary protective measure are generally willing to pay the price in internal regimentation. We are not. For us to do that would be as alien to our genius as it is repugnant to our conviction.

Second, we believe that the United States will be able to compete successfully in world markets, even though we have, and intend to maintain, wage scales far higher than those of the nations whose competition we must meet.

There is impressive evidence to substantiate the soundness of this conviction:

1. Wage scales, of themselves, do not determine the competitive position. They are meaningful only when translated into labor costs, by dividing wage rates by units produced. **A recent War Production Board study shows that in manufacturing industries generally, during the period immediately before the present war, production per man hour in the United States exceeded that in the United Kingdom, Germany and Soviet Russia by a ratio of more than 2½ to 1, and that of Japan by more than 4 to 1.** When comparison is made with available wage data, it appears that our labor costs are generally on a competitive plane.

2. Perhaps the best evidence of our ability to compete in export markets is the record of our demonstrated capacity to do so in the past. **During the entire period between World Wars I and II, the United States consistently commanded a greater share of the world's export trade than any other nation,** although the United Kingdom took a larger percentage of world imports.

3. We have been particularly successful in world trade competition in the export of machinery, vehicles, a variety of manufactured specialties, and certain agricultural products. Except in the last-named field, there is every evidence that we enjoy genuine competitive advantage over other nations, and this advantage will have been increased rather than diminished by developments during the Second World War. It is noteworthy that the goods in which we have been able to compete most successfully have generally been the products of our high wage industries rather than those in which low wages have prevailed.

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It is clear that, on a price basis, we shall be able to compete successfully in postwar markets in numerous lines. It is equally clear that such an opportunity is by no means of negligible importance to our own economy as a whole. During the years in which the censuses were taken between 1909 and 1939, our exports amounted

to from 7 to 16 per cent of our entire production of movable goods. **In the year 1938 our exports in each of the following lines accounted for more than 10 per cent of total domestic production of the particular product.**

(The figures in parenthesis are the percentages of total production exported.)

CRUDE MATERIALS: Phosphate rock (51.5), cotton (30.5), tobacco (29.4).

FOODSTUFFS AND BEVERAGES: Linseed (49.4), dried fruits (36.2), canned sardines (29.4), rice (21.0), fresh pears (15.9), canned salmon (13.8), canned asparagus (13.2), canned fruits (13.0), wheat (12.2), lard (11.7).

SEMI-MANUFACTURES AND FINISHED MANUFACTURES: Refined copper (53.1), paraffin wax (46.3), gum turpentine (42.6), carbon black (40.8), gum rosin (38.0), borax (35.9), crude sulphur (35.6), aircraft and parts (26.8), office appliances (22.3), carbons and electrodes (21.8), printing and bookbinding machinery (18.2), agricultural implements and machinery (17.0), biologic pharmaceuticals (15.3), industrial machinery (14.4), dental instruments and supplies (14.3), automobiles (14.1), benzol (13.3), goat and kid upper leather (12.8), refined lead (12.0), radio apparatus (11.8), caustic soda (11.4), refined mineral oils (10.6).

It is of major concern to all engaged in these lines of activity and in many others that foreign markets be not closed to us. It is particularly to our interest to have export outlets for our war-expanded capital goods and equipment industries. Since we undertook an important percentage of such expansion in order to furnish munitions to our Allies, it is reasonable to ask their cooperation in cushioning what inevitably must be a drastic readjustment here. The case is strengthened by the fact that the postwar world will desperately need the equipment items that we, alone, can supply.

But our demonstrated ability to compete on a price basis will not, of itself, assure us of foreign market outlets. Transportation costs, quality of product, marketing skill, technical and repair service—all are basically important. Still more important are non-discriminatory open markets and the command of dollar exchange by prospective purchasers. Our export potentials will surely be cramped in a world organized on the basis of bilateral deals and exchange controls. The availability of dollar exchange must depend upon the level of American imports and the volume of American capital loans.

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How are we to explain the skepticism of other nations toward an order which to us seems so clearly to represent not only our interest but the long-range interest of the world as well?

Soviet Russia, of course, is committed to conducting its external trade through its central government. But what of the United Kingdom? Why are there so many British voices that counsel the abandonment of what has been Britain's traditional position for more than a century? If we can understand that, we shall understand the dissent from our position of most nations whose economic positions have weakened and whose fiscal problems have multiplied during the two World Wars and the ill-starred period between them.

Essentially, their case is this:

Partly, they were forced into managed external trade policies by the Axis self-sufficiency programs, adopted in preparation for aggressive war. That can be corrected only by crushing the Axis, and by establishing a world security system that will make self-sufficiency a less compelling need.

But primarily, the reluctance of peaceably inclined nations to forego restrictive controls over postwar foreign trade stems from a deep-seated fear that is even more difficult to resolve. They fear, on the basis of past experience, that their efforts to meet payment balances arising from normal foreign trade would force a deflation of their internal economies, affecting prices, credit, wages, and finally employment. Faced with the choice, as they see it, between making adjustments in foreign trade or in their domestic economies, they lean toward the former as, at worst, the lesser of two evils.

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Since the kind of world trade system we seek is dependent upon international arrangements to assure reasonable stability of exchange rates between national currencies, we are challenged to find a formula that both will provide this and at the same time allay what other nations believe are legitimate fears with respect to their domestic economies.

But at least two major steps toward resolving such doubts can be taken upon our own initiative without recourse to the intricate process of international negotiation.

One is the rational overhauling of our tariff system, to provide other nations with increased opportunity to export to us. We can, and should, do this in a way that avoids undue cost to any segment of our economy.

The other, and probably the greatest contribution we can make toward winning a reluctant world to our point of view, will be to offer ample and convincing evidence that we are ready and able to provide a high level of employment in the United States. If we can do that, the rest of the world will wish to expose itself to our influence rather than to insulate against it, since prosperity here is the greatest single contributing factor to world-wide prosperity.

Balance of payment problems are minimized in a world of thriving trade. Britain would have little reason to resort to exchange controls if the total of postwar world imports and exports reaches an 80 billion dollar level. She may well be in a desperate plight if it should revert to the 1935 level of 40 billions.

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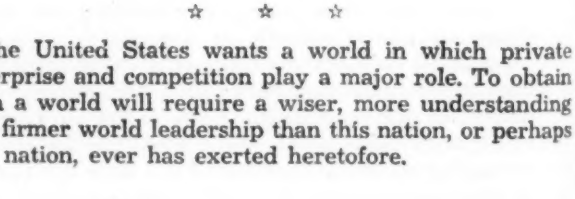
The United States wants a world in which private enterprise and competition play a major role. To obtain such a world will require a wiser, more understanding and firmer world leadership than this nation, or perhaps any nation, ever has exerted heretofore.



President, McGraw-Hill Publishing Co., Inc.

Pre-Termination Agreements

WILL EASE CONTRACT SETTLEMENT JAMS

THANKS to the Studebaker Corporation, war contractors need not wait until their contracts are cancelled before being able to find out just where they will stand on many matters of contract settlement. The fact is, that they can arrange for immediate decisions on some future termination questions through the medium of a pre-termination agreement with their contracting agency. Such an arrangement has been dubbed a termination "fire-drill," since it prepares you for what you must do before the trouble happens.

As a result of its pre-termination agreement (also known as pre-determination), Studebaker is in a position of advanced readiness so that when termination comes for certain of its contracts, it will only be necessary to take inventory and drop the figures into the pre-determined settlement formulas. No time will be wasted in ironing out arbitrary termination decisions, since they will have been made. What is most important, the company and its contracting agency have taken this action well in advance of VE-Day, when broad contract cancellations may jam the settlement machinery of both the government and industry, thereby delaying reconversion.

The Studebaker Corporation has pioneered in pre-determination of cancelled contracts. Advance planning for the disposition of government property promises to eliminate reconversion confusion

Supplementary Agreement Made

In any event, as a result of pre-determination, there is now embodied in the company's contract:

(1). Details concerning the disposal of termination materials. This includes agreement on which items the company will buy, which will be turned over to the government, and which will be scrapped. The prices which Studebaker will pay for the items it will retain have also been settled.

(2). Overhead costs arrived at by a factory overhead percentage to be applied to direct labor.

(3). The percentage of total cost to be charged for administration.

(4). The profit percentage to apply to total cost.

(5). The propriety of items of post-termination expense.

(6). Agreement to a 90 percent part payment by the government on the claim after termination upon verification of inventory quantities.

To initiate these agreements, Studebaker submitted to the Chicago Ordnance District an estimated claim covering the anticipated termination of its contract to produce the M-29 cargo-carrying vehicle, known as the "Weasel." The company had not been advised that the contract would be terminated, but simply created a "test case."

The estimated claim was prepared

on the regular Army inventory forms and summary sheets and included a complete listing of all the material which would be involved in termination. Included were actual prices and costs, and actual material disposal recommendations and offers. Naturally, the quantities included were estimates, but they were based upon the company's practice of a 30-day inventory on the "Weasel" contract. Nevertheless, this device with an approximate dollar valuation for each item indicated the relative importance of various inventory items and gave a fair over-all picture of the size of the real termination claim when the contract is finally cancelled.

Items Listed for Disposal

The first step in this pre-determination process was the listing of all inventory from raw materials to work-in-process involved in building the M-29's, and making specific recommendations for the disposal of each item on termination. Those items which the company considered unsuited for other military or civilian use were recommended for scrapping. Another classification included items which the company was willing to purchase for future use—into this group went the vehicle engine which Studebaker will be able to use in its peacetime production. The third group consisted of items which Studebaker could not use but which could probably find use elsewhere. In all cases, the company clearly explained why it recommended scrapping, sale below cost, or government use of each item.

Studebaker's offers to purchase raw materials and work-in-process ranged from 30 to 100 percent of their original cost. In many cases, use of the item by Studebaker meant adapting it to other demands.

Proposals Checked

After Studebaker had submitted its recommendations for the disposition of surplus raw materials and components, the disposal officer of the contracting agency subjected the proposal to a minute scrutiny. Only slight alterations resulted, and the proposal was incorporated in an agreement in basically its original form.

The company's offer of $15,500 for scrap with an original value of $1,-100,000 was also accepted. Inclusion of this provision in the agreement was considered by both company and government officials to represent a long-range saving. The company is required to mutilate such material purchased for scrapping so that it is usable only as scrap.

To determine factory overhead, it was agreed, at Studebaker's suggestion, to adopt the rate in effect at termination on another contract which calls for price adjustments every 90 days. For administrative overhead, it was decided that the company should apply the two percent rate it had found correct during a twelve-month check.

Post-termination costs specified as allowable include: taking a physical inventory; moving of inventory; moving of scrap; mutilation of scrap; the preservation of parts; the packing, loading, and shipping of parts; contract termination division expenses; and insurance. Some of these expenses will apply to parts for which Ordnance will determine eventual disposition. In any event, only the propriety of including these items was established, and not the actual amounts which will be involved at termination.

On the basis of a most recent contract for the M-29, it has been agreed that Studebaker shall receive a profit rate of six percent on the selling price, or 6.4 percent on cost.

Pre-determination Sanctioned

When Studebaker's proposal was taken up with Washington, it was so well received that the Office of Contract Settlement issued Regulation No. 3, authorizing pre-determined settlements. This action was taken within two weeks after the proposal reached Washington. Courtney Johnson, assistant to the chairman of the Studebaker Corporation, described this as the fastest government action he had ever heard of.

The Army has indicated that, when termination occurs, it will verify the inventory as it is taken by Studebaker.

No segregated storage will be necessary for the scrap and the usable material the company will buy, constituting together about 80 percent of the purchase value of the inventory. The remaining 20 percent —that which the contracting agency will take over—need only be stored until shipped.

Subcontractors Enlisted

Studebaker is asking its 400 first-tier subcontractors to present estimated claims, similar to those prepared by Studebaker, and many of them are already in. This is being done with a view to arriving at decisions in regard to property disposal, costs and profits of subcontracts. The company figures that there will be at least 25 decisions on disposal to be made with each of its first-tier subcontractors, making at least 10,000 decisions to be approved by the subcontracting officer and the company. Thus, the advantage of getting this done in advance is obvious.

It has been pointed out to subcontractors that this method of predetermination may also be used to assist in solving a company's financial problems. According to regulations, a company may get partial payments up to 90 percent based upon estimates of its claim, but this is at the discretion of its contracting agency upon certification by the prime contractor. Because of this, a company depending upon this source of financial help must know in advance what it is going to get in the way of partial payments.

According to Mr. Johnson, the company found that this sample claim required the approval of the Ordnance Department on over 200 decisions. While these represented major decisions, the fact remains that decisions involving the company's subcontractors may run into 10,000. Yet, the bulk of these involving many basic points of possible differences can be settled well before termination.

Termination Department

The Pre-termination Method was developed by Studebaker's termination department, which was set up early in 1944 as a separate unit. The regular departments were, and still are, completely absorbed with war work, and will be equally busy on problems of reconversion when termination comes. Drawing administrators, attorneys, accountants and clerical personnel from outside the company, the department has been built up to 37 employees. The organization has been trained by constant study of the laws and regulations, as issued, and by direct field contact with 400 first-tier subcontractors.

An attempt has been made to pass on to all of the subcontractors all the information which Studebaker can obtain about the problems of contract termination and settlement of claims. Subcontractors are being urged to organize in a similar fashion. They are being advised to secure supplies of the necessary forms and to familiarize themselves with their requirements.

The department's annual budget of $250,000 indicates the importance which Studebaker attaches to speedy terminations.

Opportunities and Challenges of SURPLUS PROPERTY

BY THE END OF THE WAR the Surplus Property Board, set up under the Surplus Property Act, will be faced with the job of selling, leasing, scrapping or stockpiling some $100,000,000,000 in surpluses of all types. Many industries are gravely concerned over the very volume of some of these surpluses, while some business men look to these leftovers as cheaper sources of supply or as business opportunities. Yet, it behooves all of them to be constantly informed of surplus developments, since they may be materially affected one way or another by these events as they occur.

The Surplus Property Act (see AM, 11/9/44, p. 119) outlined the means for the forward planning of acute surplus problems under direction of a three-man Surplus Property Board to replace the Surplus War Property Administration, set up by Presidential decree pending the passage of the surplus law. Former Senator Guy M. Gillette has been appointed chairman of the Board, and the two other members are Lt. Col. Edward Heller, and Robert A. Hurley. Until new regulations of the Board are issued, all outstanding regulations of the Surplus War Property Administration continue in effect.

Since the volume of surpluses being handled by the SPB is still a small portion of the over-all total, industries still have a good chance to get their internal organization in shape for buying, selling or otherwise participating in surplus disposal developments. Business men should stimulate their purchasing, production and engineering departments to think in terms of leftovers. This means getting and encouraging men with imagination as well as technical training. Many leftover items may at first appear unsuitable for use or resale, but further examination frequently shows that they can be readily adapted.

The size of the surplus disposal job has been both exaggerated and minimized. It is easy to do both. Exact figures are frequently unavailable. However, a reasonable estimate of the magnitude of the surplus disposal job at the end of the war will start with a total of close to 104 billions, but will wind up with a final figure of 20 billions or less.

Impact Enormous

The over-all figures serve to indicate only what the first impact of war leftovers will be on the economy. Because most economic actions have a "multiplier" effect, the ultimate business repercussions of surplus disposal will probably be much larger than the 20 billion dollar figure suggests.

In most cases, over-all estimates of available surpluses are not immediately useful to business planning. Therefore the purchaser should be on the lookout for specific figures on the particular types of leftover in which he is interested. These figures are frequently available even though not widely publicized. The purchaser should check with his Industry Advisory Committee to see if estimates have been given to it. If not, he should urge the immediate preparation of these figures by the appropriate disposal agency.

This over-all analysis of the important aspects of government-owned surpluses is based on a survey made recently by the Research Institute of America

The Surplus Property Act distinguishes between owning and disposing agencies. There are now eight disposal agencies which sell leftovers that have been declared surplus by owning agencies. These include:

(1) Treasury Department Procurement Division handles consumer goods, plus all surplus property located in Porto Rico, Hawaii and the Virgin Islands.

(2) Reconstruction Finance Corporation and its subsidiaries handle all capital and producer goods, all real property except that assigned to the Maritime Commission, National Housing Agency and Federal Works Agency; plus surplus property of all kinds located in Alaska.

(3) Maritime Commission disposes of all maritime property.

(4) Navy Department will handle combat ships or naval auxiliaries.

(5) War Food Administration is charged with surplus food disposal.

(6) National Housing Agency is responsible for surplus housing other than that controlled by the War Department or the Navy Department.

(7) Federal Works Agency disposes of surplus property of the type financed through FWA, except that located on housing project sites.

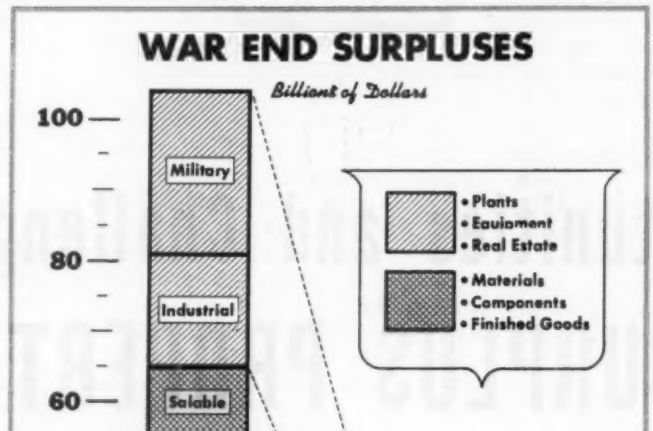
(8) Foreign Economic Administration will handle all surpluses located abroad, except commercial ships of more than 1,000 gross tons.

Manufacturers can get a more specific item-by-item breakdown of the property, materials and products assigned to each disposal agency by examining the Appendix to SWPA Regulation 1. Copies of

this commodity breakdown may be obtained by writing to the Government Printing Office in Washington or from regional offices of any of the disposal agencies listed here. Each agency already has or will have branch offices for handling inquiries, and it is advisable for businessmen to establish early contacts with the nearest offices of the agencies they plan to deal with.

However, until the owning agencies declare these items as surpluses, they are empowered to sell: (a) termination leftovers; (b) scrap and salvage; (c) leftovers abroad in areas where there is no disposal agency representative; and nominal quantities of surpluses whose cost does not exceed $2,500.

Since regular trade channels are the hardy perennials of surplus disposal, they are to be used as far as practicable. Sales are to be handled so that they won't disrupt normal business. Speculators and promoters are to be barred. Big hitch to this sound position is that it's almost impossible to agree on what's "regular" and who's a "speculator."



Negotiated Sales

While negotiated deals, sealed bids and open auctions are all being used in selling leftovers, the tide is running strong in favor of negotiated sales. The Surplus Property Act permits sales to be made without regard to any existing legal provision for competitive bidding. Since the law also contains a specific clause releasing disposal officials from personal liability for losses in surplus sales they negotiate in good faith, it removes the chief reason why government officials were generally inclined to favor sealed bids. Bids and auctions will continue, however, where speed isn't too important and where they're customary in normal sales.

Increased emphasis on negotiation gives buyers of leftovers a better chance to press for legitimate price reductions. Here are some of the bargaining points that can be used: (1) To a manufacturer engaged in war production, sales of leftovers that will help the war effort can be made very expeditiously at reasonable prices; (2) In negotiating a price, the manufacturer should emphasize any freight charges to be absorbed to permit use or resale of the surplus; (3) legitimate bargaining points for brokers or distributors include commissions, handling charges or profit allowances necessary to effect disposition; (4) Where quick turnover is unlikely, the manufacturer shouldn't hesitate to emphasize storage costs and depreciation or deterioration involved if the property isn't sold; (5) He should account fully for all his inventory hazards and carrying charges; (6) A distributor or retailer who will offer post-sale services or guarantees when he resells the surpluses should use the value of such services as an argument for a price adjustment.

Price Determination

Determining a fair price for surpluses is a problem that will produce many headaches in the procurement agencies, as well as in SPB and OPA. There are opposing pressures in both government and business. Within the business world, manufacturers of new goods want high prices to kill off competition from surpluses, while business buyers want low prices for profitable use or resale of the leftovers. These opposite attitudes are reflected in the approach of OPA and SPB to the surplus pricing problem. While OPA's primary interest is to set price ceilings to prevent users from overpaying, SPB's chief concern is to set price floors to assure the greatest possible return to the government.

Present balance of forces is still in favor of the high-priced people. Because of wartime shortages, leftovers could frequently be sold above ceiling prices for corresponding new products if OPA has not applied ceilings to such sales.

More important than wartime shortages in the long run for maintaining prices are price floors. The Administration is determined to introduce rigid price floors for leftovers if necessary to prevent price depreciation or disorder in the market for specific commodities.

Termination Prices

In addition to price floors and specific pricing rules, a continuance of the general 75 percent pricing formula now used in setting prices for termination leftovers can be expected. Assumption is that a 25 percent profit margin isn't sufficient to attract speculators, but is big enough to encourage legitimate distributors, dealers and war contractors to dispose of leftovers. However, it's a good bet that the 75 percent formula will topple by the end of hostilities. One big loophole that now exists is the permission to sell at less than 75 percent of cost or market price after a "reasonable" time. The term "reasonable" has been left conveniently undefined so that, if necessary, lower prices can be quickly established. While returns from leftover sales won't hit the low of World War I—35¢ on the dollar—they'll almost surely be closer to 50 percent than 75 percent.

Small lots — so-called nominal

quantities worth less than $2500—and leftovers from contract cancellations where the entire termination claim is less than $10,000 before disposal credits, offer buyers an immediate opportunity for lower prices. For such transactions there is no price floor. They present an excellent opportunity for small business to get leftover materials and products at lower than usual prices.

Disposal agencies may make sales for cash, credit or other property. The only restriction on credit is that, in the case of raw materials, consumer goods, or small tools, hardware and non-assembled articles, no extension of credit shall be for a longer period than three years.

Guarantees on surpluses are another question. Although nobody expects that the government will offer a 90- or even a 30-day warranty on items like jeeps, purchasers can legitimately demand: (a) that surplus property be accurately described and classified by disposal agencies, and (b) that the goods when delivered are exactly as described when purchased. If errors in quantity or quality turn up when merchandise is delivered, appropriate adjustments in kind or in price differentials should certainly be permitted.

Central Warehousing

Establishment of central warehouses or depots scattered throughout the country is a probable development in many types of surplus disposal. A trailblazer for this technique is the program for disposal of aircraft surpluses undertaken by ASU and the Metals Reserve Company.

Surplus packing and delivery will be for and to the immediate buyer, not the ultimate consumer. Until improvements along these lines are introduced, surplus buyers should count on a certain degree of inadequate packing and shipping inconvenience.

While the Baruch-Hancock policy of selling "all you can as soon as you can" will be the rule for most surpluses there are some fields where it would be ruinous. Postwar surpluses of some items will be so large that, if released, they could saturate the market for many years to come. At the same time, disposal and policies that are adequate for goods in short supply may be disastrous for some over-abundant items, such as basic metals and minerals, machine tools, and various metal products. To control this situation, the government has available, besides the device of price floors, the technique of (1) stockpiling of "strategic" materials and establishment of standby plants; (2) restricting imports of surpluses; and (3) withholding surpluses from the market.

Besides permitting government stockpiling for the purpose of accumulating critical materials to guard against future shortages, the Surplus Property Act permits the withholding of surpluses from the market to combat an over-supply. However, the stockpiling provisions of the Act can be made to apply to fabricated products and non-strategic commodities only be an extremely loose construction of their meaning.

Industry Advisory Committees

Industries threatened by overhanging war surpluses should begin working at once through their Industry Advisory Committee with SPB, WPB and the appropriate disposal agencies on this problem. Planning is already being conducted by a number of industry groups along these lines:

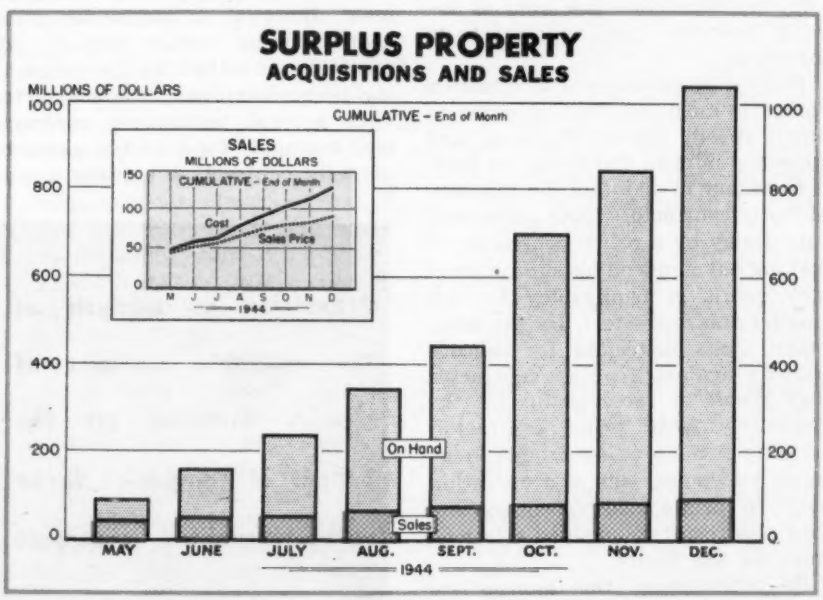
(*a*) Scrapping of what is not readily adaptable for peacetime use.

(*b*) Exports for special postwar projects. Foreign relief and rehabilitation can absorb large quantities of many surplus items.

(*c*) Gradually releasing surpluses into the market.

While the Surplus Property Act makes no official provision for use of Industry Advisory Committees, is is expected that SPB and the disposal agencies will continue to avail themselves of the advice of WPB IAC's, pending the formation of special surplus disposal committees. Some Congressmen are pressuring for legislation authorizing Industry Advisory Committees to be set up to help determine specific surplus disposal policies. It is possible that the Attorney General may try to circumvent the enactment of such legislation by writing a letter to SPB specifying the extent to which IAC's may be used in surplus disposal activities. So long as their functions are purely advisory on surplus disposal, the IAC's are immune from anti-trust prosecution. Committees may not take action on their own initiative on recommendations they have submitted, nor may they try to determine policies for an industry, attempt to compel anyone to comply with any government request, or make agreements as to specific industry action.

Plans for withholding surpluses from the market may also be developed by a small number of firms in an industry, rather than on an industry-wide basis. Any such joint action plan should have specific clearance from the Department of Justice. The proposal must (a) be sharply defined and definitely limited in time, (b) make clear how its operations will help smooth reconversion in industry and (c) that it doesn't exclude competitors or bar entrants. Pending formation of Industry Advisory Committees by the SPB or disposal agencies, applications for approval should be sent to the neighboring WPB Industry Division. If WPB approves of the plan, it will be passed on for clearance of Department of Justice.



Advantages of Partial Payments On Terminated War Contracts

BY JOHN H. PRIME, PROFESSOR OF FINANCE,
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION, NEW YORK UNIVERSITY

CONTRACTORS, both prime and sub, who hold terminated war contracts find their working capital tied up in accounts receivable, inventories, and partially completed products. At termination they find their working capital "frozen" and face the problem of inadequate working capital. It is necessary therefore to "unfreeze" their working capital pending the final settlement of their claims.

One of the purposes of the Contract Settlement Act of 1944 is to provide adequate interim financing pending the settlement of termination claims. The Act requires the Government to provide such financing within thirty days after proper application. In order to take advantage of the provisions of the Act, a contractor should (*a*) prepare his termination claims promptly after the receipt of notice of termination and (*b*) determine the kind of interim financing most appropriate to his needs.

Prompt preparation of termination claims is most essential in order to obtain speedy interim financing; and speeding interim financing, in turn, is necessary to maintain the solvency of many contractors, both prime and sub. Delay by a prime contractor in making payments on his subcontracts may result in bankruptcy for his smaller subcontractors. By the same token, suits instituted by subcontractors against a prime contractor may result in receivership for the financially weak prime contractor. Looking at the problem from a long-range viewpoint, lack of cooperation between prime and subcontractors may also result in strained relationships for the future.

In determining the appropriate kind of interim financing, contractors, both prime and sub, have a choice of (*a*) advance payment, (*b*) partial payment, or (*c*) T loan (see AM, 11/9/44, p. 116). An advance payment is made from an advance payment credit established prior to termination. Unless such credit has already been established, this method of interim financing is not available after termination. Advance payment as an effective and widespread means of interim financing, therefore, is of very limited value.

The more common method of interim financing is, and will be, the partial payment. This form of financing is available to all contractors, regardless of whether the contractor is large or small, a prime or a subcontractor, or a contractor with fixed-price (lump sum) contracts or with cost-plus-a-fixed-fee contracts.

Before applying for a partial payment, however, a contractor must keep in mind certain factors. All contracts are settled by the contracting agency involved. The contractor with several terminated contracts may not apply for a partial payment upon the contracts as a group; a separate application for a partial payment must be made for each terminated contract. An overstatement of the amount due on the claim carries with it a penalty amounting to 6 percent of the amount overstated. Any overpayment by the contracting agency arising out of an overstatement of the claim carries with it a penalty on the overstatement and an additional penalty on the overpayment. The overpayment is considered as a loan from the Government which is payable on demand and which bears interest at an annual rate of 6 percent from the date of the excess payment to the date of repayment.

Presenting an analysis of the available mediums of interim financing for the benefit of companies faced with terminated contracts

A contractor seeking a partial payment should take two steps: (*a*) Obtain a copy of Form 4 which is the application for partial payment form and (*b*) confer with the contracting agency to determine the proper method of filling out and filing the application.

Two types of partial payments are available to the contractor: Immediate partial payment and cost-supported partial payment. If financing is needed before a complete settlement proposal can be prepared, the contractor should apply for an immediate partial payment. The application is based upon the contractor's estimate of his own termination charges and should exclude profit, cost of special facilities and items of a controversial nature and the charges of subcontractors. The application must also indicate the unliquidated partial, progress, and advance payments received prior to and after termination and any credits for disposal or retention of inventory included in the contractor's charges. These payments and credits are de-

The author of this article is one of the instructors of the courses in contract termination problems being conducted at New York University. As shown here, the attendance at a typical class includes both military personnel and industry representatives. The course was made possible through the cooperation of 18 military, government agencies

ducted from the estimated termination charges in determining the net claim against which the partial payment is requested.

In an initial application for an immediate partial payment, the estimate of the contractor's own charges need be no more than adequate to support the request for partial payment. A low estimate of the contractor's own charges will not prejudice the final settlement of his claim nor his right to request additional partial payments. If the application is satisfactory to the contracting officer, he will approve a partial payment amounting to a minimum of 75 percent and a maximum of 90 percent of the amount certified as due on the contractor's own costs allowable to the terminated portion of the contract.

On the other hand, if the settlement proposal has been completed, the contractor may apply for a cost-supported partial payment. In this instance, the contractor indicates the charges as listed in the settlement proposal. He must attach to the application a copy of the settlement proposal. If approved by the contracting officer, the contractor will receive a partial payment consisting of 100 percent of the claim, at the contract price, on undelivered acceptable items completed prior to termination; 90 percent of costs of raw materials, purchased parts, supplies, direct labor and manufacturing overhead allowable to the terminated portion of the contract; a reasonable percentage of other allowable costs; and any additional amounts deemed necessary by the contracting officer to provide interim financing.

In the instance of prime contractors either of doubtful financial responsibility or with inadequate records, the contracting officer may insist upon making the immediate or cost-supported partial payment by means of a controlled partial payment. The payment is deposited in a controlled account with a bank in the name of the prime contractor. Payments are released from the account as the contracting officer approves items of the contractor's own costs or as payments are made to subcontractors.

Important to Subcontractors

A partial payment is especially important to the subcontractor as a means of interim financing. In applying for a partial payment, the subcontractor fills out Form 4 and files it with the contractor in the tier immediately above him. The latter certifies that he has examined the application, has considered the subcontractor's general reputation, has no reason to doubt the accuracy of the amount certified by the subcontractor, and recommends that the requested partial payment be made. This contractor sends the application to the next higher tier contractor who repeats this procedure. The application finally is submitted by the prime contractor to the contracting officer. This is commonly referred to as the "contractual chain."

The subcontractor may receive a partial payment from the contracting agency in any one of three methods. The normal method is through the contractual chain, that is, the contracting agency makes the partial payment to the prime contractor and the prime contractor and intervening contractors either pay the subcontractor or credit the payment against amounts owed the prime or intervening contractor by the subcontractor.

A second method of partial payment to the subcontractor is through a controlled partial payment account. This method is used in instances where the prime or intervening subcontractor is either insolvent or in imminent danger of insolvency or for any reason is unable or unwilling to pay any partial payment received for the benefit of the subcontractor. Payments are released to the subcontractor from the controlled account with the approval of the contracting officer.

Finally, if payment through the contractual chain would cause the subcontractor unwarranted delay in the receipt of partial payment or if it is not feasible to make the payment from a controlled account, the contracting agency may make a partial payment directly to the subcontractor.

Undoubtedly, contractors, both prime and sub, will seek a partial payment as an initial means of interim financing. It is the most direct and the most logical method.

Sperry Termination Organization Coordinates Work of Existing Departments

BY WALTER F. TITUS
VICE PRESIDENT IN CHARGE OF CONTRACT TERMINATIONS, SPERRY GYROSCOPE COMPANY, INC.

A carefully planned termination program is carried through by a "sparkplug" terminations unit made up of assembly, audit, inventory and negotiation groups

AN ORGANIZATION geared to purchasing, production and sales must view termination of contracts as a separate and full-time departmental activity. This was the decision of officials of Sperry Gyroscope Company, Inc., Brooklyn, New York, when preparations were made to expedite the settlement of terminated war production contracts.

A separate termination organization was set up with separate assembly, audit, inventory and negotiation divisions.

The assembly division is charged with the responsibility of getting in the subcontractors' claims, recommending payment and preparing the prime claim.

The audit division determines the degree and method of audit of subcontractors' claims, as well as being responsible for instructing and routing auditors, preparing recommendations on these claims for the claims review committee, and reviewing and auditing the prime claim. The recommendations of this division accompany each subcontractor's claim to the contracting officer.

The inventory division is responsible for receipt of claims material, keeping of accurate records of subsequent receipts and issues, and guarding the material until disposal has been made. Inventory is also responsible for assisting in every way in the disposal of claims material.

The negotiation division is responsible for determining courses of action for each particular claim. When dealing with different services on terminations affecting different factories and a laboratory, each with different ways of handling costs and other factors, it is necessary to determine a course of action. This division has the job of rationalizing obviously inapplicable regulations, the urging of decisions on disposal, keeping relationships with the rest of the business on a cooperative basis as well as discussion, amendment and settlement of claims.

While the termination department is a separate portion of the Sperry Company, it must naturally rely upon, and work cooperatively with, other portions of the organization.

Pre-termination meetings with the contracting officer are considered highly desirable to attainment of a more orderly termination and various representatives attend.

Production Control Stops Work

The stopping of work is done by production control, upon advice from the sales department. Termination's interest here is to see that the sales department permits no delay in informing production control as to the modification involved, and further to see that production control gets to work.

To determine what subcontractors are involved and the extent to which they should be stopped is wholly a function of production control. Concerned are inventory and continuing demand figures, involving common parts and spares, before consideration for quantity on order.

Procurement Stops Subs

The job of stopping subcontractors belongs to the procurement department. This unit placed the orders, wrote the contracts and is close to the subcontractors.

Getting in the subcontractors' claims, however, is a job that one gets better at the longer one works at it. This job is assigned to the termination department.

The next job is that of auditing the subcontractors' claims, which includes a review of their audit of suppliers' claims. There is more to this than meets the eye. Ordinarily there is no parallel to it anywhere else in the business. It is not only an auditing job; it is negotiation as well. Good business judgment must be used in determining the extent and method of audit. Questionable items must be examined, contracting officers' current viewpoints must be explained. Estimates must be supported. The claim must be fair and reasonable and often considerable selling ability is necessary to get it that way. This job of auditing subcontractors' claims is a specialty for which men must be trained. It peculiarly belongs within the terminations group.

Before presentation of the subcontractors' claims to the contracting officer, the termination audit manager prepares recommendations which are distributed to members of the claims review committee a few days before they meet. The claims review committee meets about every ten days and is comprised of the director of termination, the claims manager, the audit manager, the inventory manager and the vice president in charge of terminations. Regularly assigned representatives of the procurement, sales and treasury divisions are also members of this committee. Contracting officers and their representatives are invited to sit in when possible. This committee either passes a claim unanimously or rejects it back to the audit manager for clarification and revision.

When the subcontractor's claim has been approved by the contracting officer, payment is made.

Inventory Disposal Aided

The contracting officer will not approve the subcontractor's claim until his inventory has been disposed of; hence Sperry usually encourages the subcontractor to make a disposal offer. Where the claim is large, Sperry organizes a joint disposal committee, consisting of a product engineer, a production control representative and an inventory analyst, together with engineering and disposal representatives for the contracting officer. This committee sometimes meets at the office of the subcontractor and decides upon the disposal of the entire inventory.

Establishing the prime claim inventory schedule of material, work-in-process, finished parts, assemblies, finished units, tools and test equipment is the joint responsibility of production control, manufacturing engineering and product engineers and inspectors. This is logical, since the individuals are thoroughly familiar with the items involved. Upon termination they are assigned to work on the assembly of claim inventory schedules.

The terminations group segregates and safeguards claims inventories, relieving the manufacturing division of the work and responsibility, and getting this material out of the way.

The costing and extending of prime claims is carried out by the cost department. However, this work is audited by the termination group.

To effect the disposal of its own inventory, after all diversions have been made and after vendors have taken back what they will, Sperry's terminations group works with the contracting officer's disposal representative or team. The contracting officer has been presented with a bill of material of the product in question, along with recommendations for disposal, long before it is possible to furnish an inventory schedule, so that work may be commenced on disposal of some of the components even before the quantity is known.

The speed of this procedure is such that a bill of materials is furnished the contracting officer within one week after the pre-termination meeting is held. The manner in which this procedure facilitates the material handling aspect of terminations was evident in the instance of a 612-item assembly, of which Sperry recommended junking 549 items. The contracting officer agreed on 548 of them.

The job of determining post-termination expenses belongs to the cost department even though a separate cost system is operated. Charges against termination activities may originate in nearly any part of the business and the cost department needs those charges for post-termination expenses for reconciliation overall. The post-termination expense carries direct hours and labor and so far as possible all charges are assessed directly to the contract being worked on. However, there are also unallocable charges and these are distributed across the direct hours involved.

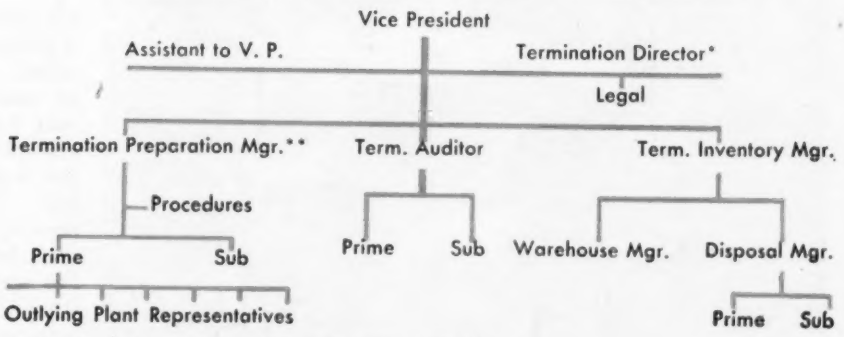
The preparation of the prime claim and the review before final presentation to contracting officer are functions of the termination group.

The keeping of adequate progress records is a job for the terminations group. Other varied duties are the keeping abreast of laws, regulations, directives and interpretations, and the advising and educating of subcontractors as well as company departments.

The Sperry Termination organization is built along lines adapted to rapid expansion by absorption of desirable personnel, who would otherwise find themselves out of jobs because of terminations. Good production control men, product engineers and manufacturing methods engineers can play an important part when a claim pertaining to a product with which they are familiar is being prepared and negotiated.

With respect to terminations, it is the belief of the officers of the Sperry Gyroscope Company that a firm with war contracts should make everyone in its organization acutely conscious that "Any contract may be cancelled tomorrow!"

CONTRACT TERMINATIONS DIVISION ORGANIZATION



*Negotiator—Co-ordinator **Preparation of Claims

CLAIMS REVIEW COMMITTEE

Vice President
Termination Director
Termination Manager
Termination Auditor
Procurement Representative
Treasury (Accounting) Representative
Sales Representative
Customer's Representatives (by invitation)

JOINT DISPOSAL COMMITTEES

Disposal Manager
Purchased Products Engineer
Product Engineer
Production Control Supervisor
Sales Representative
Customer's Representative

A.A.F. RESIDENT SETTLEMENT TEAM

Contracting Officer	Lt. Colonel
Property Disposal Officer	Captain
Negotiator	Civilian
Auditing*	Major (Overall Negotiator)

*Field Accounting Officer (for all Services)

British Adapt Drill Presses For Unusual Wartime Operations

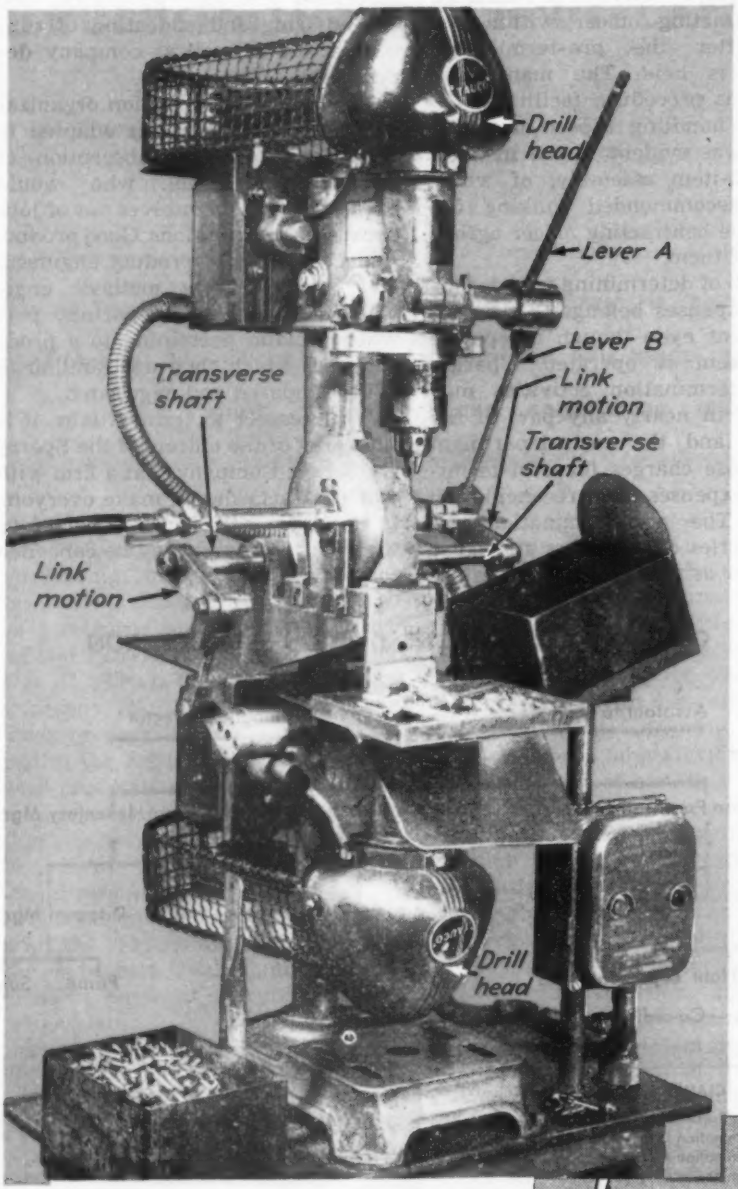
BY W. J. HARGEST, AMERICAN MACHINIST WAR CORRESPONDENT

Special tooling made possible the use of standard bench-type presses in turning out several war weapons during the emergency

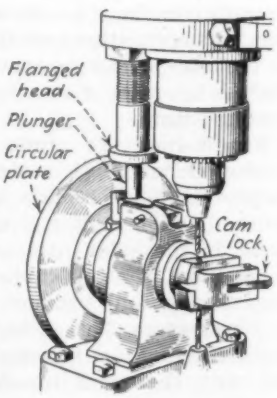
UNUSUAL ADAPTATIONS can be made of the familiar cylindrical-column drill press. The examples illustrated were developed in British factories to achieve maximum production with the tools that were available.

One arrangement involves the mounting of two Tauco drill heads on an extended column for drilling operations on a detonator striker. Operated by link motions, the drill heads work in opposite directions simultaneously. Holes are drilled a little more than halfway through the striker, the components are revolved 180 deg. and drilled again, thus completing two holes that are free from burrs.

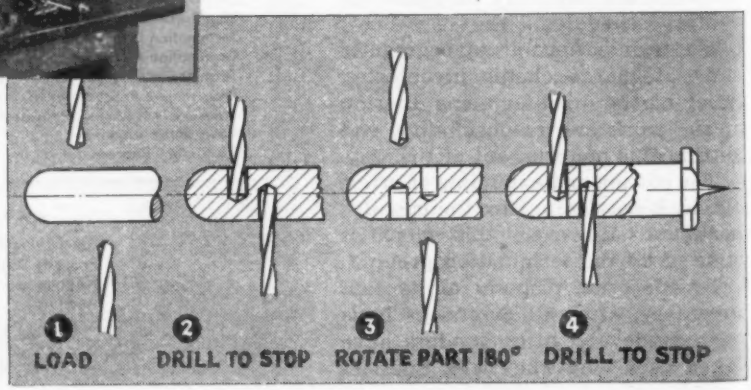
The detonator striker is held firmly by a cam-lever lock. The jig has four drill bush-

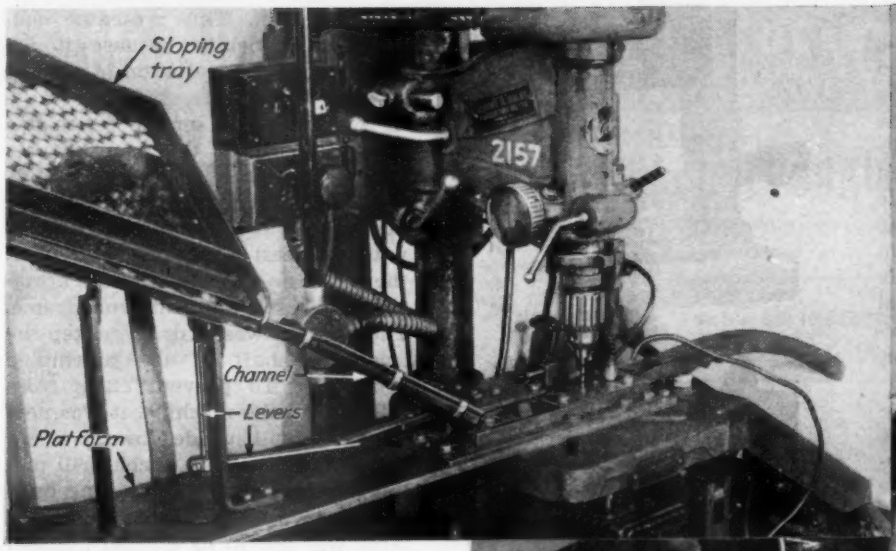


Two drill heads are mounted on the column of this machine to drill holes from opposite directions in a detonator striker. The drill heads are operated simultaneously by link motions connected to a transverse shaft. When lever A is pulled down, the two drills are advanced and lever B moves up to operate the link motions. Right—The opposing drills make holes halfway through the striker, which is indexed 180 deg. for final drilling

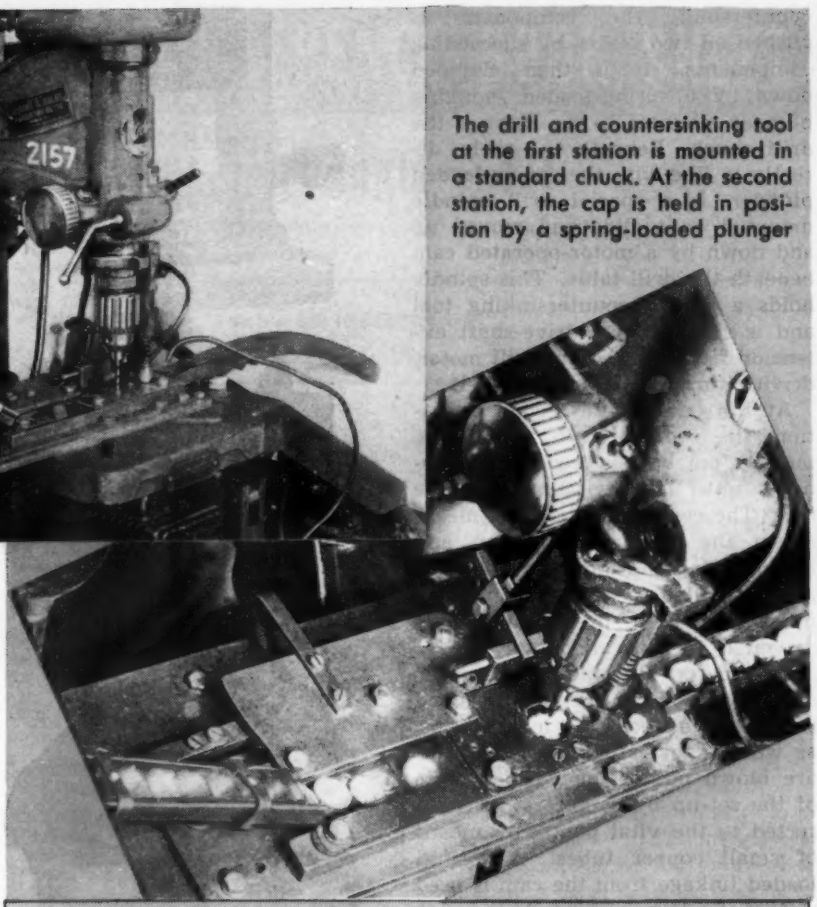


The detonator striker is clamped in this jig, which is fitted with an interlock to prevent the drills from operating until the part is indexed properly. The interlock consists of a plunger and flanged head. The latter fouls the flange of the circular plate which has two locating slots 180 deg. apart

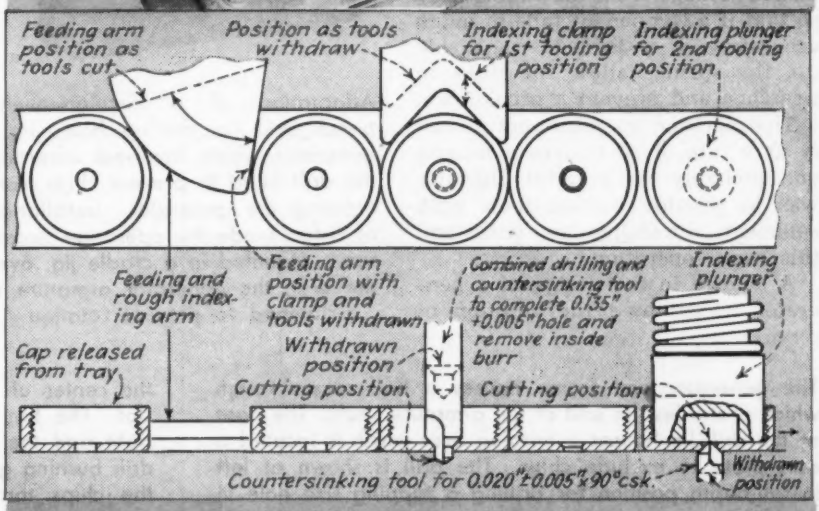




Cartridge-retaining caps are positioned, drilled, and countersunk automatically on this bench-type drill press. Sorted on a raised perforated metal platform, components gravitate into a sloping tray. Levers operate an oscillating device which prevents the parts from jamming. The levers also operate a gate which allows single components to enter the sloping channel leading to the jig



The drill and countersinking tool at the first station is mounted in a standard chuck. At the second station, the cap is held in position by a spring-loaded plunger


Feeding arm position as tools cut
Position as tools withdraw
Indexing clamp for 1st tooling position
Indexing plunger for 2nd tooling position
Feeding and rough indexing arm
Feeding arm position with clamp and tools withdrawn
Combined drilling and countersinking tool to complete 0.135" +0.005" hole and remove inside burr
Indexing plunger
Cap released from tray
Withdrawn position
Cutting position
Cutting position
Countersinking tool for 0.020" ±0.005" x 90° csk.
Withdrawn position

Cartridge-retaining caps are drilled and countersunk from the top at the first station, and countersunk from the bottom at the second station

ings, two on each side. An interlock prevents operation of the drills between the indexing positions of the jig. An air blast directed through the axial shaft of the drill jig ejects the finished part and cleans out the chips.

The sequence of operations follows: Load the part in the jig, close the cam lock, drill to the stop and withdraw, rotate the jig by means of a handle on the interlocking disk, drill the second time to the stop and withdraw, unlock the cam lever, rotate the jig back to its first position, and operate the air valve to blow out the part and chips. The ejected parts fall into a sloping receptacle to the right of the drill press table.

Trouble was originally experienced with drills breaking, and it was first thought the opposing holes were slightly out of line. However, it was later traced to incorrect grinding of the drills (angles unequal), blunting of the drill which usually destroys the point, or failure to resharpen or change both drills at the same time.

Set-Up for Automatic Feeding

A circular-column bench-type drill press was also used to meet a demand for a machine to drill and countersink both sides of a cartridge-retaining cap simultaneously. Increased production in limited space was necessary. A method of automatic feeding and ejection was developed.

Components are sorted on a raised, perforated metal platform. The perforations allow chips to drop clear —a major point in any intricate mechanism. The platform permits the proper loading of all parts. The components gravitate into a sloping tray where an oscillating device keeps the parts agitated to prevent jamming. Levers operating the oscillator also operate a gate which allows single components to enter a sloping channel leading down to the jig. A feeding arm at the bottom of the channel roughly indexes the components accurately for each machining operation.

The drilling and countersinking tool is mounted in a standard drill chuck. After being drilled and

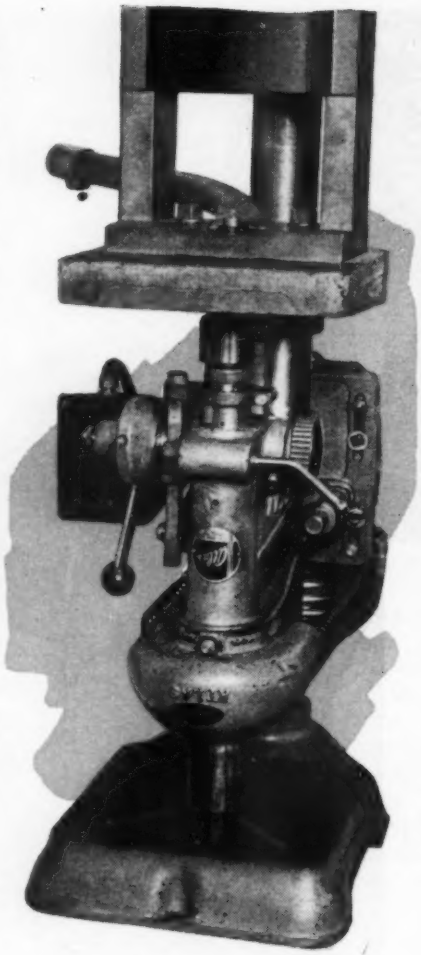
countersunk, the component is pushed on two places by succeeding components. It is then clamped down by a spring-loaded indexing plunger mounted to the right of the drill chuck. Beneath the table, directly in line with the spring-loaded plunger, is a special drill spindle mounted on a slide and moved up and down by a motor-operated cam beneath the drill table. This spindle holds a second countersinking tool and is rotated by a drive-shaft extension from the normal drill motor, driving through pulleys and belt.

At the end of the second operation, the component is free to be pushed on by succeeding components until it gravitates to a tote box. The component transfer mechanism, the cutting feed action, and the clamping and indexing functions are controlled by a single cam beneath the drill press table, and driven by a separate motor.

Transparent Ivorine was used to cover the component channels and the intricate operating mechanisms, as well as for safety guards. Chips are blown out of the various parts of the set-up by compressed air directed to the vital points by means of small copper tubes. A spring-loaded linkage from the cam is used so that if a component fails to index accurately or is loaded wrong side up, the springs allow the links to telescope and prevent a breakdown.

The machine operates continuously at a rate of 50 strokes a minute and probably the greatest difficulty was to provide cutting tools with sufficient durability to withstand this rapid operation.

A change in the design of a generator necessitated the addition of a cooling fan. This presented considerable difficulty because it not only required installation of the fan in new generators, but also to a larger number in service which had been returned to the manufacturer for overhaul.



Adaptation of a circular-column bench drill for drilling holes in a generator shaft involved inverting the drill head to prevent chips from entering the generator. Installation of a fan made the operation necessary. Mounted in a cradle jig, over the drill, the generator armature is clamped to prevent rotation

It was necessary that the fan be designed to fit the existing generator with the least alteration. Moreover, there was no projection of the armature shaft beyond the end frame. The solution was to drill and tap the armature shaft of the assembled generator. To prevent chips from falling into the machine, it was necessary to drill upside down.

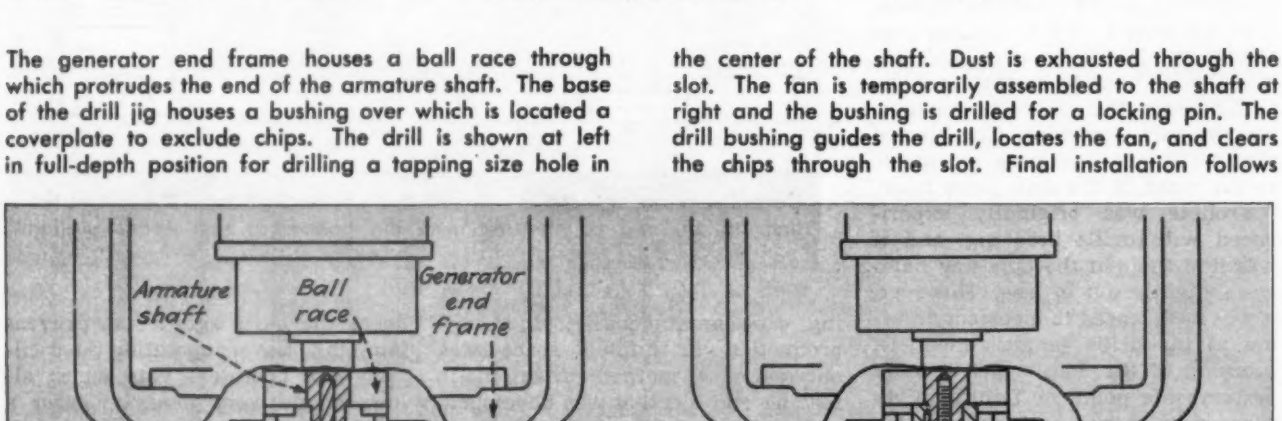
A circular-column bench drill met the requirements. The drilling head was turned over, while the drill table was left in its normal position to take the drill jig, which is a vertical cradle and accommodates the generator. Two machines are set up in this manner with a slight difference of drill size and jig design.

The shaft is hand-tapped. The fan is then assembled temporarily to the shaft by means of a small-headed screw. After drilling, the fan is removed and the temporary screw is exchanged for the final locking pin, spring washer and screw.

At one period, much trouble was caused by taps breaking in the end of the shaft. This has been overcome largely by grooving the tap shanks down to the core diameter, so that in the event of breakage there is always something to grip for extraction.

All of these operations have been tried successfully for several years and demonstrate the advantages of such novel adaptations for a standard drill press.

The generator end frame houses a ball race through which protrudes the end of the armature shaft. The base of the drill jig houses a bushing over which is located a coverplate to exclude chips. The drill is shown at left in full-depth position for drilling a tapping size hole in the center of the shaft. Dust is exhausted through the slot. The fan is temporarily assembled to the shaft at right and the bushing is drilled for a locking pin. The drill bushing guides the drill, locates the fan, and clears the chips through the slot. Final installation follows



Simple Indexing of Any Angle—VII

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

***N* = Holes per Division. *D* = Appropriate Hole Circle**

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.500	100	200																		
.501																				
.502											101	201	97	193	96	191	91	181	87	173
.503	84	167	82	163	79	157	77	153	75	149	72	143	70	139	69	137	67	133	65	129
.504			62	123	60	119	59	117	57	113	56	111	55	109	54	107			52	103
.505	101	200	50	99	49	97			47	93	46	91	91	180	44	87				
.506	42	83			41	81	40	79			39	77					37	73	73	144
.507	36	71			35	69			102	201	101	199	100	197	98	193			96	189
.508	95	187			93	183	92	181	91	179	90	177	89	175			87	171	86	169
.509	85	167			83	163	82	161	81	159			80	157			78	153	77	151
.510	102	200	78	149	75	147					73	143	72	141			71	139		
.511	70	137	92	180			68	133			67	131	66	129			65	127		
.512					63	123			103	201	102	199	61	119	101	197	60	117	99	193
.513			98	191	97	189	58	113	96	187	57	111			94	183	93	181	74	144
.514	92	179	91	177			90	175	89	173			88	171			87	169	52	101
.515	103	200			34	68	84	163			83	161			82	159			81	157
.516			32	62			79	153			47	91	78	151	93	180	77	149	46	89
.517	76	147			45	87			104	201	74	143	103	199	73	144	102	197		
.518	72	139	100	193			71	137	99	191	98	189			97	187	69	133		
.519			95	183					94	181	93	179			66	127	92	177		
.520	104	200			90	173	64	121	51	98	89	171			88	169	75	144		
.521	87	167	37	71					81	117	85	163			84	161				
.522	83	159	59	113	94	180	82	157	105	201	58	111	104	199	23	44	103	197	80	153
.523					79	151	101	193	56	107	78	149	100	191			99	189		
.524			98	187			54	103			75	143	96	183			74	141	95	181
.525	105	200	94	179	73	139	52	99	93	177	72	137			92	175	51	97		
.526	91	173					90	171					89	169	69	131			88	167
.527			68	129			106	201			48	91	105	199	95	180	78	144	104	197
.528			47	89			84	159			102	193			83	157	101	191	64	121
.529			100	189					99	187							80	151	62	117
.530	106	200	44	83	79	149	35	66	96	181			78	147	95	179			43	81
.531	60	113	94	177	17	32	17	32	93	175	76	143	42	79			92	173	75	141
.532			58	109	91	171	107	201	74	139	90	169	106	199	57	107	73	137	89	167
.533	105	197					96	180					103	193	87	163	71	133		
.534	55	103	102	191	39	73			101	189	31	58	85	159	100	187			69	129
.535	107	200			38	71			68	127	98	183			15	28			97	181
.536	82	153	52	97	37	69	96	179	81	151			66	121	95	177			80	149
.537	58	108	94	175	65	121	108	201	79	147	93	173	50	93	107	199	64	119		
.538	92	171	106	197					91	169	77	143					104	193	90	167
.539	76	141					103	191					75	139	102	189	61	113	88	163
.540	108	200	101	187	47	87			87	161	60	111					53	98	86	159
.541	99	183					59	109	85	157	98	181			78	144			97	179
.542	71	131	58	107	45	83	109	201	96	177	83	153	70	129	108	199	95	175		
.543	82	151	107	197	44	81	94	173			25	46	81	149	56	103			93	171
.544	105	193			80	147	43	79	92	169	104	191	55	101	67	121			91	167
.545	109	200							102	187	78	143								
.546	89	163	77	141	65	119	59	108	100	183			88	161			76	139		
.547	99	181			110	201			75	137	98	179	23	42	109	199	86	157	40	73
.548	97	177			108	197			34	62			96	175	62	113			73	133
.549	84	153	95	173	106	193	39	71			50	91	72	131	94	171	105	191		

***N* = Holes per Division. *D* = Appropriate Hole Circle**

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.550	110	200					104	189	71	129	60	109	49	89	38	69	103	187	92	167
.551	81	147			70	127			59	107					48	87			101	183
.552					111	201			79	143	100	181	21	38	110	199	89	161		
.553			99	179	78	141	109	197	57	103	88	159			98	177				
.554	77	139	87	157	46	83	97	175	107	193	56	101	66	119	76	137			96	173
.555	111	200									105	189	100	180						
.556			104	187	94	169	84	151	74	133					54	97			93	167
.557	83	149			112	201	67	121	102	183	63	113								
.558	101	181	72	129			91	163	110	197			100	179			111	199		
.559	90	161	71	127			99	177	80	143	108	193	61	109	89	159	19	34		
.560	112	200			107	191	79	141	51	91	88	157	37	66	97	173	106	189		
.561	69	121	101	180	55	98			96	171	105	187	41	73			50	89		
.562	77	137	95	169	103	183					81	144					102	181	94	167
.563	67	119	58	103	49	87			111	197			102	181			84	149	75	133
.564			66	117	101	179			92	163	35	62	83	147	109	193	61	108	74	121
.565	113	200			91	161					108	191			99	175			73	129
.566	90	159	107	189			47	83	98	173					102	180	106	187	89	157
.567	55	97	114	201			97	171	80	141			63	111			113	199	46	81
.568	96	169			25	44	104	183			112	197	87	153			62	109	95	167
.569	33	58	103	181			78	137	82	144	86	151	45	79			102	175	110	193
.570	114	200	61	107			69	121			85	149	101	177	109	191				
.571									108	189										
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.573	51	89	98	171	90	157			82	143			113	197			105	183	97	169
.574			62	108			58	101			81	141	114	181	50	87	96	167		
.575	115	200	111	193	88	153	42	73	103	179	80	139					38	66		
.576	110	191			87	151	102	177	83	144			79	137	109	189			15	26
.577			116	201	86	149	56	97			108	187	93	161			104	180	115	199
.578	63	109			85	147	48	83			70	121	92	159	114	197			77	133
.579	99	171			106	183			62	107			91	157	40	69	69	119	98	169
.580	116	200	65	181	76	131	112	193	83	143			36	62			97	167		
.581	104	179			111	191			75	129			82	141	89	153			103	177
.582	110	189	117	201			46	79	53	91	60	103			81	139	102	175	116	199
.583							105	180							115	197	101	173	87	149
.584			66	113	59	101	52	89	45	77					107	183	100	171	93	159
.585	117	200							72	123	113	193	65	111	106	181	99	169	58	99
.586	92	157			51	87			112	191	78	133	105	179			98	167		
.587	118	201			64	109	111	189	84	143			104	177			77	131	117	199
.588					110	187							103	175	83	144	116	197	106	180
.589	96	163	76	129					89	151			102	173	69	117			82	139
.590	118	200	108	183	108	183	85	144	49	83	75	127	114	193					26	44
.591					107	181			55	93	42	71			113	191	87	147		
.592	119	201			106	179			93	157			112	189			99	167	118	199
.593					105	177			54	91	73	123	111	187	19	32	19	32	117	197
.594	79	133	60	101	41	69	104	175	107	180			66	111			91	153	47	79
.595	119	200	97	163	25	42	103	173	78	131	53	89	109	183	84	141	115	193		
.596	90	151					96	161			102	171	71	119	108	181	37	62	114	191
.597	120	201	83	139	86	144	89	149	46	77	95	159	101	169	52	87	107	179	113	189
.598	119	199	64	107			70	117	76	127	82	137	88	147	94	157	100	167	112	187
.599	118	197																		

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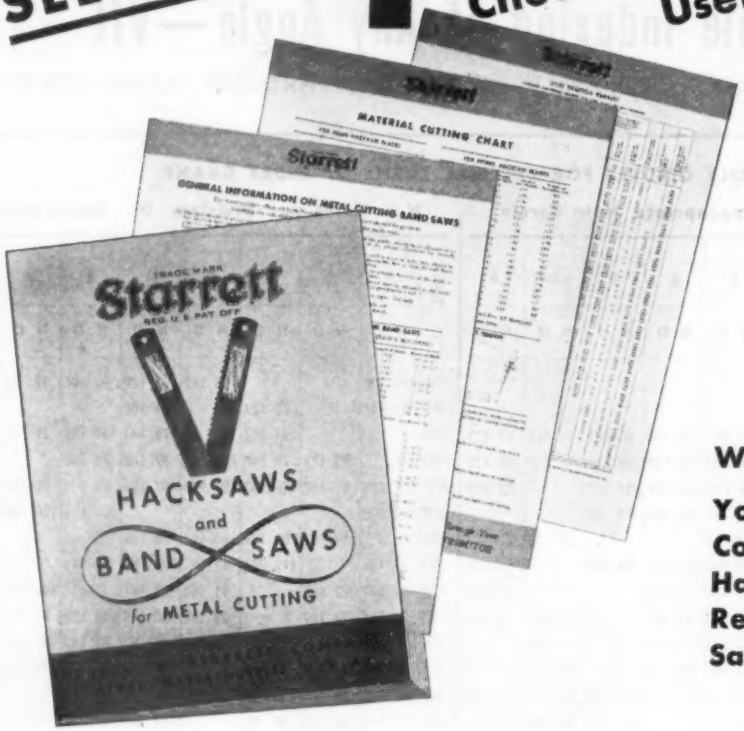

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Starrett "Skip-Tooth" Metal Cutting BAND SAWS for fast cutting of magnesium, aluminum, bronze, soft brass and other nonferrous metals; also for special compositions, fibre, bakelite, plastics and wood.

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Simple Indexing of Any Angle—VIII

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

N = Holes per Division. *D* = Appropriate Hole Circle

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.600	120	200																		
.601	116	193	110	183	98	163	92	153	86	143	80	133	74	123			68	113	65	108
.602	121	201	115	191	109	181	103	171	50	83	97	161	91	151	44	73	85	141		
.603	120	199	79	131	114	189	108	179	35	58	102	169	67	111			96	159		
.604	119	197			87	144	113	187	55	91	107	177	78	129	78	129	101	167	49	81
.605	121	208	95	157			23	38	89	147	66	109	109	180	106	175	83	137		
.606			40	66	117	193	77	127			111	183			54	89	71	117	105	173
.607	122	201	17	28					116	191	65	107	48	79			110	181		
.608	121	199			104	171			87	143	115	189			98	161			109	179
.609	81	133	120	197	53	87	92	151			103	169	114	187			75	123	86	141
.610	122	200	97	159	108	177			47	77			69	113	91	149	102	167		
.611			110	180			118	193	107	175	96	157	74	121	63	103			123	201
.612	112	183			90	147			79	129			117	191	106	173			38	62
.613	122	199	84	137			111	181	73	119	100	163	27	44			116	189	62	101
.614	105	171			121	197			94	153	110	179			67	109			99	161
.615	123	200							104	169							108	177	93	151
.616					61	99			98	159	119	193			111	180	103	167	124	201
.617	87	141	108	175			50	81	92	149	113	183	21	34			118	181	76	123
.618	55	89	123	199			81	131			107	173	60	97	86	139	112	181		
.619	117	189					122	197			70	113	101	163	44	71	75	121	106	171
.620	124	200	111	179	80	129	116	187	85	137					54	87			95	153
.621			100	161	41	66	105	169	64	103	110	177	69	81	120	193	74	119	125	201
.622	79	127			112	180			89	143	94	151	99	159			109	175	114	183
.623	114	183	124	199	43	69			48	77					58	93	63	101	68	109
.624			88	141	108	173	123	197												
.625	125	200													117	187	102	163	87	139
.626	82	131			67	107	62	99	57	91	52	83					126	201	121	193
.627			111	177	106	169	101	161	96	153	96	153			86	137	113	180	81	129
.628			125	199			120	191	115	183			110	175	105	167			100	159
.629	39	62	95	151	56	89			124	197			119	189					114	181
.630	126	200	46	73			75	119	29	46			99	157					94	149
.631	118	187	65	103	89	141	113	179					108	171			127	201	103	163
.632			122	193	55	87					74	117			93	147	112	177	50	79
.633	69	109	126	199			114	180			102	161	121	191	64	101	45	71	116	183
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.635	127	200			101	159			115	181	68	107			82	129	110	173		
.636									119	187							128	201	114	179
.637					72	113	123	193	109	171			95	149	44	69	81	127	37	58
.638	104	163			127	199	90	141	113	177			53	83	76	119	122	191	115	180
.639	108	169	85	133	62	97	117	183			94	147	126	197	103	161				
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.641	75	117			84	131					102	159	111	173	120	187	129	201		
.642	52	81			70	109	88	137	124	193									18	28
.643					128	199	110	171	92	143			65	101	56	87	47	73		
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.646	73	113					95	147	117	181	64	99	88	133	130	201				
.647	121	187	99	153					112	173	90	139	125	193			103	159	46	71
.648	116	179	70	108	129	199			59	91			72	111					85	131
.649	98	151	111	171			124	191	50	77	63	97	89	137	128	197				

N = Holes per Division. *D* = Appropriate Hole Circle

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.650	130	200			119	183	106	163	80	123	67	103	54	83			123	189	110	169
.651	97	149			84	129			114	175					131	201				
.652	118	181			105	161			122	187	92	141			109	167	126	193	79	121
.653			113	173	130	199					83	127	117	179			17	26		
.654			104	159	70	107	53	81			125	191			91	139	129	197	74	113
.655	131	200			57	87			116	177	78	119	118	180	120	183			61	93
.656	103	157	124	189	21	32	21	32	107	163	86	131	65	99	132	201	111	169	90	137
.657			115	175			94	143	71	108	119	181			123	187			25	38
.658	127	193	77	117	52	79	131	199	106	161	81	123			110	167			114	173
.659			29	44	118	179	60	91					93	141	126	191	84	97	130	197
.660	132	200	101	153	68	103			106	159	72	109	72	109			113	171		
.661	117	177	119	180	121	183			125	189					133	201			92	139
.662	47	71					100	151	104	157			108	163	112	169	116	175	59	89
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.664			87	131	91	137	95	143	99	149			107	161	115	173	119	179		
.665	133	200																		
.666															134	201				
.667																				
.668							129	193	125	187	121	181	117	175	109	163	105	157	101	151
.669			93	139	89	133	85	127	81	121					73	109			69	103
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.671			100	149	49	73	96	143			92	137	135	201						
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.673	107	159			103	153	134	199			130	193	97	144			126	187	31	46
.674			122	181	60	89	118	175	87	129	114	169			56	83	83	123	110	163
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.677	109	161			128	189			63	93			124	183	82	121	122	180	101	149
.678	120	177			59	87	97	143	135	198			19	28	131	193	93	137	74	109
.679	55	81	127	187	108	159			89	131			125	181	104	153				
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.681	111	163			47	69	62	91	77	113	107	157	137	201			30	44		
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.683			125	183	110	161	123	180	136	199	54	79	121	177			80	117	132	193
.684					117	171					128	187	102	149	76	111			50	73
.685	137	200	124	181	74	108	135	197	61	89	109	159			120	175			131	191
.686	83	121	94	137			105	153	116	169	138	201	46	67	57	83			68	99
.687	90	131	123	179							99	144					130	189	108	157
.688			75	109	64	93	53	77	137	199	126	183	115	167	104	151			124	180
.689			133	193			122	177	111	161					60	87	129	187	89	129
.690	138	200	49	71			136	197			29	42	125	181	67	97				
.691			85	127	132	191	103	149	121	175	139	201	74	107	92	133	110	159		
.692							117	169							124	179	106	153	88	127
.693			131	189			113	163	138	199			120	173	77	111			102	147
.694	127	183			134	193	109	157	125	180			116	167	91	131			123	177
.695	139	200			130	187			137	197			112	156	32	46			119	171
.696					126	181			133	191	140	201	62	89						
.697			122	175	76	109					83	119			90	129	97	139		
.698	104	149	111	159	118	169	125	179	132	189	139	199	51	73			58	83	65	93
.699	72	103	79	113	93	133	100	143	135	193										

(This table will be continued in an early issue)

JACK & HEINTZ SPEEDS
PRECISION PRODUCTION AUTOMATICALLY

New Britain Multiple Spindle Screw Machines remain on the job productively 24 hours a day, seven days a week at the Jack & Heintz plants at Cleveland ... producing millions of essential aircraft parts illustrated.

Tough engineering and manufacturing headaches are quickly cleared up daily at Jack & Heintz . . . where speed, precision and production are paramount. Here American ingenuity is built into aircraft engine starters, generators, motors, gyro pilots, magnetos and instruments . . . all vital war equipment for one purpose . . . Victory.

To meet rigid war production schedules, Jack & Heintz installed a battery of dependable New Britains to produce accurate machined parts in unheard of quantities . . . parts requiring complex cuts and fine finishes . . . machines to retain original accuracy and operate efficiently with minimum downtime. These same methods will prove equally effective in solving technical problems confronting Industry in attaining postwar objectives. Keep in touch with the New Britain Sales-Engineer near you . . . he has the automatic answer to your manufacturing problems.

NEW BRITAIN

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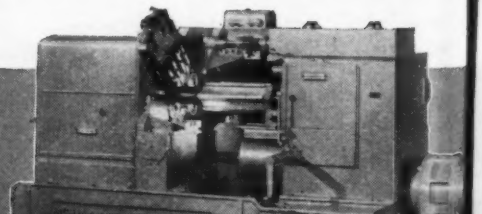
NEW BRITAIN-GRIDLEY MACHINE DIVISION



Gaging Business

$299,000,000 in Tools

The military has informed machine tool builders at their recent Industry Advisory Committee meeting in Washington, that an additional $299,000,000 in tool orders may have to be placed to support various expanding military programs, such as tanks and trucks. Faced with a $282,000,000 backlog at the end of January, the tool industry would be in a very serious position if such new orders actually materialize. Even though $95,000,000 of its January, 1945, backlog consisted of unrated orders, the remaining $187,000,000 represented rated military and Russian orders largely for delivery over the next six months.

To make matters worse, the military expects that the new tool orders would be required to support 1945 programs, which means that delivery would have to be made in time enough to use the tools in 1945 production, or by October, 1945, at the latest. This would give the industry nine months to fill the present rated backlog of $187,000,000 and new rated orders of $299,000,000. This would require a production rate of $54,000,000 monthly, in contrast to current tool shipments of less than $38,000,000 a month. If tool builders could not make delivery within the required time, many orders would probably be cancelled.

Labor Gain Slight

Lack of manpower has prevented tool builders from lifting shipments to levels closer to incoming orders. In January, employment in tool building rose to 56,500 from 56,000 a month earlier. This gain helped the industry increase January shipments to $37,498,000 from December's $36,782,000. However, new orders continued substantially in excess of shipments. January's $62,000,000 in new business was only moderately below December's $65,000,000, but well above shipments. The rate of cancellations was relatively unchanged at $3,110,000 for January as compared with $2,904,000 for December.

January shipments included $4,500,000 in Russian orders, and almost $6,000,000 in unrated orders. The latter largely consisted of tools on which production had started months ago. However, some government officials have complained that Russian shipments are proceeding slowly, and point to the $88,000,000 in unfilled orders on hand. But some observers believe that probable cessation of unrated shipments will be translated directly into Russian shipments, which would make delivery of the business possible by its September 30, 1945 deadline. Russian orders are rated AA-1, while many military and essential orders bear AA-3 ratings.

Truck, Tank Needs

At least $100,000,000 of new tool orders may stem from the changed truck and tank programs, involving heavier units. This means retooling of plants producing components and some expansions. For example, driving axle and transmission capacity must be expanded for both tanks and trucks. Cylinder sleeve capacity, already enlarged, will have to be increased further. Truck engine capacity is also affected, and some increases in special friction bearings production will be necessary.

The 1945 truck program calls for greater numbers of heavy six-wheel drive types, at the expense of four-wheel or two-wheel drive types. For component manufacturers, it means more and heavier components. For example, the 6 x 6 truck takes three driving axles instead of one.

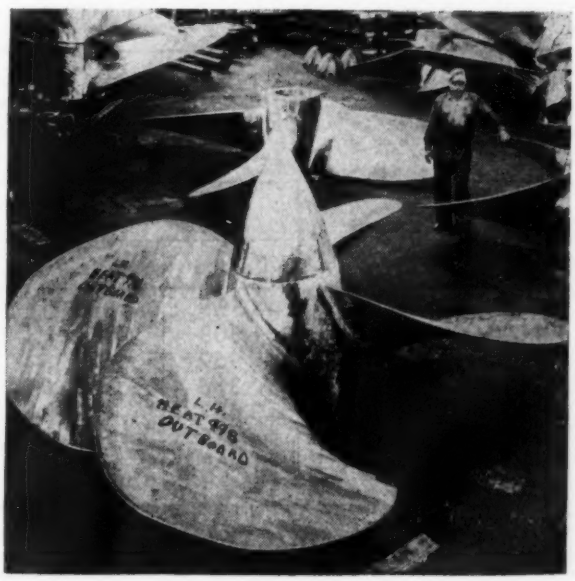
Heavier tanks, more heavily armed, are also requiring larger components. The heavier medium tanks, the M-4A3, armed with a 76-mm. gun, and the M4, armed with a 105-mm. howitzer, will need wider tracks and a new type of suspension. The same probably applies to the new giant tanks, the details of which are still being guarded.

Materials vs. Manpower

The growing steel crisis, which would worsen in the event of a coal strike, is likely to upset manpower requirements estimates of last December based upon production schedules then expected. Since then, the January steel production loss of 350,000 tons due to bad weather, and the growing necessity for the military to request special emergency allotments of steel, have convinced some observers that there would not be enough steel to occupy all the men said to be needed in war plants to adhere to schedules.

Skepticism over the seriousness of manpower shortages gained as high government officials continued to use the December labor estimate in late February. The contention is that the seriousness of the situation is certainly doubtful if reliable current figures cannot be secured. Some criticism was also forthcoming of the government's use of the *gross* figures of 900,000 men needed for the armed forces and 700,000 men needed in war plants during the first half of 1945. These figures make no allowance for normal increase in the labor force as new workers come of age, return of war veterans, and the recent trend of labor from nonessential plants to war jobs. After such adjustments, analysis reveals that the net shortage will be between 150,000 and 200,000 men. These figures approximate the level of the continuing labor shortage during 1944, and is only a fraction of one percent of national employment.

The French lend-lease agreement for $2,575,000,000 marked the opening of a new phase in American aid to its Allies under the Lend-Lease Act. This contract includes non-war items which we have agreed to supply the French. If it is upheld, it may lead to similar agreements with Russia and Great Britain.



11-Ton Propellers—Machined bronze propellers ready for shipment from Cramp Brass & Iron Foundries division of Baldwin Locomotive Works for ultimate use in Victory ships. Cramp is now producing some 125 propellers monthly, about 95 for merchant ships and the balance for warships. Each propeller must go through a fine balancing operation

Second Quarter Steel Prospects Serious; Allotments Slashed

Carry-over of unfilled 1944 and first-quarter 1945 orders, production loss of 350,000 tons, and increased military requirements cut into non-war allotments. Possible coal strike and manpower problems may worsen situation

WASHINGTON — Unprecedented Army demand for steel, production losses caused by the weather and manpower deficits, plus threatening allotment inflation due to carry-overs, caused the WPB Requirements Committee to have the most difficult time since early in the war in dividing the steel "pie" for the second quarter. Carbon steel allotments were slashed by ten percent, thus dislocating essential civilian programs.

The War Department requested 500,000 tons more steel than it ever had before. The heavy snows and the coal embargo caused a production loss of 350,000 tons of steel in January. Yet, WPB faced a 2,500-000-ton carry-over of unfilled orders and allotments in making its second quarter allocations. The carry-over was composed of 1,700,000 tons of unfilled 1944 orders, and over 800,-000 tons of first quarter CMP allotments for which there was no steel.

Requirements 22% Over Supply

Unscreened requirements were approximately 19,700,000 tons, while estimated supply was 16,075,000 tons.

By only allotting 14,309,000 tons or 103.3 percent of the second quarter estimated supply of carbon steel, WPB hoped to gain about 1,443,000 tons on the carry-over, or about one-half of the 3,000,000-ton deficit. This means that WPB expects the steel industry to operate at 98 percent of capacity which is by no means assured because of the threatened coal strike on April 1, possible production losses through lack of manpower, and from floods. (The last coal strike cost an estimated 200,000-ton loss of steel production.) Alloy steel allotments amounted to 120 percent of the estimated alloy supply of 1,-776,000 tons. Over-allotments are frequently leveled off by subsequent cancellations.

Army Carry-over Huge

The 800,000 tons of supplemental allotments carried over from the first quarter represent supplemental orders placed by the War Department under overriding production directives issued in January. This hard core of orders together with other important carry-overs caused the Requirements Committee to lop off 657,000 tons of steel from the claim of the Operations Vice-chairman who represents the WPB industry divisions, the Office of Civilian Requirements and the National Housing Authority. FEA and ODT were trimmed about 500,000 tons in their allotments.

Program Conflicts

Not only was over-all supply in trouble, but program conflicts had to be resolved when they involved competition for the same steel products. An increase of over 450,000 tons in the shell steel program caused a deficit in steel for rails. Increased bomb demand of about 250,000 tons caused a corresponding decrease in pipe for the petroleum industry. Complicating the flat-rolled picture was a doubling of the landing mat program to nearly 100,-000 tons.

Dizzied by overriding directives calling sometimes for deliveries four months ahead of schedule, steel producers have been promised that future directives will not be issued except in an emergency. WPB and the War Department have agreed that directives will not be issued calling for deliveries more than 45 days ahead of schedule.

Barring such complicating factors as too many emergency directives and even assuming that there will be no coal strike, the steel industry will still face manpower shortages, caused by the draft, quits, and absenteeism.

SECOND QUARTER STEEL ALLOTMENTS FOR LEADING AGENCIES
(000's Omitted)

AGENCY	REQUESTED		ALLOTED	
	Carbon	Alloy	Carbon	Alloy
ARMY	4,521	846	4,256	786
NAVY	1,308	349	1,214	323
MARITIME	969	3	921	5
ARCO	318	19	275	17
OVC*	3,657	489	2,977	390
PAW	436	107	412	100
FEA	1,468	50	893	38
ODT	1,527	134	1,065	96

*Operations Vice-chairman.

International Federation Being Formed by European Engineers

LONDON—An international federation of engineers is being fostered by a committee of European engineers who have been meeting in London for a year. The name of the organization has been tentatively set as the "International Federation of Engineering and Allied Institutions," and the aims and objectives, a constitution, and a provisional program of work to be done has been drawn up. Care is being taken that no one nation will obtain sole control of the proposed body.

A small group of engineers, who felt that engineers should have some international body representing them, began work on the idea in early 1944, and invited members of various technical societies to discuss the federation plan with them on June 17th. Preliminary plans were drawn up there, and submitted to a second meeting on October 21st to which representatives of some sixty institutions were invited.

Postwar Formation

The Federation is proposed to be inaugurated in Paris six months after the fall of Germany, by an Assembly and possibly a Technical Exhibition of economic planning as promulgated to different countries. The Congress which will finally inaugurate and bring into existence the Federation can then be decided.

Committee members and the nations they represent include: Dr. H. W. Dickinson, chairman, for Great Britain; as vice-chairmen, Lt. Col. A. Aintoine for France, W. O. MacLauren for Canada, and Robert S. Nilsson for Sweden.

Mr. Nilsson is acting as Hon. Sec. pro temp, at 42, Warrington Crescent, Maida Vale, London, W.9, England. He will handle all inquiries.

Inside Detroit

Labor Conflict Looms

The stage is being set here for a gigantic struggle that may not even wait for the end of the war. Management and labor, under the stress of war, have been restrained in their dealings until now.

But the statement of the Mead Committee that it was about to come to Detroit to investigate charges of labor hoarding on one hand and failure of labor to produce on the other has touched off a situation that may prove dynamite. The strikes that have heightened the situation are not the direct outgrowth of the feeling that is rising to the surface but is some indication of the tempers of individuals.

Fireworks Started

Mutterings have been heard from both sides before but only sub-rosa. But George Romney's wire to the Mead Committee, immediately following its announcement that it was sending investigators to Detroit, started fireworks.

George Addes, fiery secretary-treasurer of the UAW, didn't let Romney's attack on the conditions in the automotive shops pass. He charged wastefulness and inefficiency to management and more. Romney didn't back up but piled on the charges. Addes came back with more vitriol.

Although the Mead Committee postponed its trip here, the situation has not calmed considerably. Romney is urging the committee not to wait too long. The union leaders are gathering their own ammunition.

When the blowoff comes, it will be something to watch. The top automotive officials have privately expressed great fears for the postwar pricing of autos unless labor became more efficient than it has been since the war. They express concern with the attitude of even their experienced men under the influence of stewards and minor leaders and the protection afforded them by government decree.

Unions Deny Inefficiency

On the other hand, the unions point out that the record of the automotive plants is something that even management always brags about. Even today they state, output is being increased with less workers in the shops. How can that be done without efficiency on the part of the workers, they ask.

The precariousness of the situation between the warring factions is apparent to all. The War Production Board, not taking sides, has been wary of unrest that would interfere with its big program.

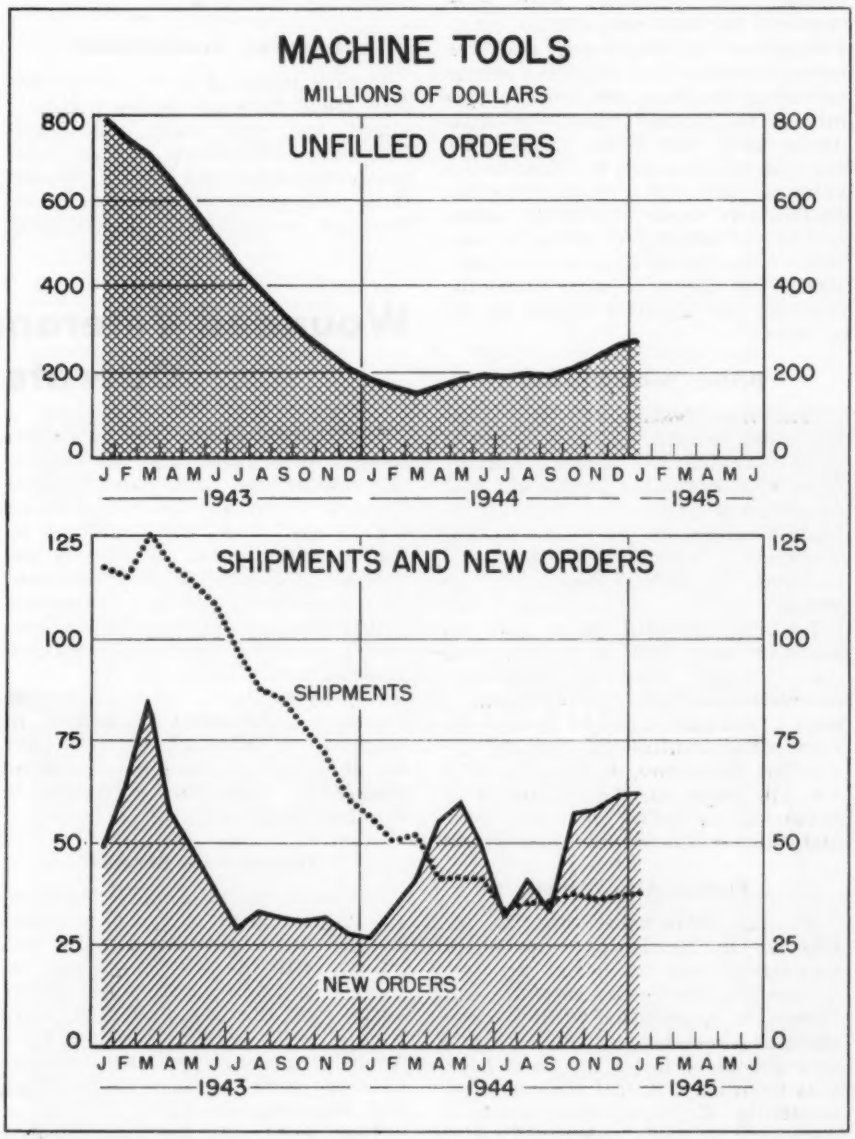
There may be some way to quiet the situation before it reaches the boiling point. But there isn't much optimism here. The Mead investigators are still sorting evidence. If the committee does come, they will have a hard time deciding who is to blame and why.

Strangely enough, there is one ground on which both sides meet. That is the need of some help in getting machine tools before reconversion actually comes about.

Association Aids Veterans

The tool and die association is sponsoring a plan to aid the returning wounded veterans at Percy Jones Hospital. They are fitting out a nice machine shop at the hospital in two buildings which will give the wounded men some good training and help them recover.

Many of the tool shops are donating idle equipment to this enterprise and are hunting up other machines which they can buy and ship to Battle Creek. Instructors will be furnished by the government and some of the heads of the tool and die shops, as well as other big industrialists will give lectures.



Expanding Backlog—At the end of January, unfilled tool orders totaled $282,000,000. January's new business of $62,000,000 was only slightly below December's $65,000,000, but well above January's shipments of $37,498,000 (December's shipments totaled $36,782,000). Cancellations were relatively unchanged: $3,110,000 for January, $2,904,000 for December

Europe Hopes for Record Industrial Conditions After Germany's Defeat

BY WILLIAM J. HARGEST, ASSOCIATE EDITOR

LONDON—European nations, particularly France and Czechoslovakia, expect to find their heavy industries benefited by the defeat of Germany, and to see these industries rise far above prewar levels during the postwar period. In fact, present indications lead continental engineers to expect that the United States and Britain will find postwar markets on the continent far in excess of present estimates.

Engineers and industrialists interviewed in Paris and London have voiced their agreement with plans that call for the complete de-industrialization of Germany, and the inflexible control of whatever manufacturing facilities she will be permitted to retain. There is little doubt, after the Yalta Conference, that the attempt will be made to deprive Germany of certain industries, particularly those absolutely essential to the waging of modern warfare. Continental engineers are emphatic in their opinion that the machine tool industry should be one of these.

British Attitude Firm

The same reaction can be expected from Britain. Unlike postwar days of 1918 and 1919, there is likely to be little sympathy for the German people, and little effort to help rebuild German industry or alleviate economic conditions. Britain has suffered too much these past six years.

Looking forward to a postwar Germany with little or no heavy industry—steel, aluminum, synthetic petroleum products, electric power—both Czechoslovakia and France expect other continental nations, including Germany, to turn to them for all types of heavy industrial products, including machine tools and other metal-working equipment.

French Also Benefit

Prewar Germany went to extremes in furnishing mechanical equipment and industrial products to central European countries and Russia in competition with Czechoslovakia, bartering when necessary to trade these items for farm products from agricultural nations. Consequently, Czechoslovakia found it necessary to trade extensively with nations overseas to the detriment of her balance of trade. On but a slightly smaller scale, the same applies to France. It is this situation that the peace treaty will change if Germany should be de-industrialized, and that is exactly what France and Czechoslovakia mostly expect.

It is the opinion of a number of continental engineers that central European nations heretofore considered agrarian will become more and more industrialized. This thought emanates from the fact that highly intricate mechanical products can be made with unskilled workers operating machines properly designed and tooled. This will permit farm workers to transfer themselves to industry, and they will no doubt do this because it offers greater economic opportunities.

Industrial Readjustments

If such thoughts prove to be correct, trade between highly industrialized and previously non-industrialized continental nations will reach unprecedented levels. Should it be only partly correct, the industrialized nations will undoubtedly find a prosperity far greater than existed before. Added to this will be the trade with a de-industrialized Germany. Russia figures predominantly in such thinking, but it is presumed that for some years following the war she will be engaged in rebuilding her own industries—this is evidenced by her recent requests for huge credits in both the United States and Britain.

Aside from these potentials of business in postwar Europe, there is urgent need for all types of industrial products in every country. Germany in occupying the continental nations has commandeered all industry for her war effort. Civilian goods in all categories have not been manufactured. For example, you have but to see French motor cars, buses and trucks to realize their complete and utter state of disrepair. They will be scrapped as soon as new ones are available. The same applies to every type of luxury article imaginable. Factories everywhere will need new equipment, and it will be months following the war before they are producing sufficient quantities of goods to meet the barest of domestic demands.

Wounded Veterans Successfully Operate Hospital War Plant

CLEVELAND—With the co-operation of local industries, 400 wounded veterans at the Army's Crile General Hospital, Cleveland, work a daily shift in a "war plant" set up within the hospital. Primarily the project is a successful experiment in occupational therapy, with machines designed or modified to provide prescribed exercises for injured muscles which need use.

As by-products, the enterprise produces substantial quantities of war-needed material, earns money for the veterans, and teaches some elementary skills that will assist in eventual employment.

Industry Cooperates

To start the shop last December, the Lamson & Sessions Co. provided five Sawyer automatic nutting machines, with the operating lever rebuilt to provide special kinds of exercise for the leg and foot, drill presses, with handles replaced by a knob, to use hand muscles, countersinkers, spinner nutters, die filing and other equipment.

Last week, the Reliance Electric & Engineering Co. joined the project, providing such light work for bed and ambulatory patients as small assemblies, cutting, bending and soldering wires for electronic control equipment.

In the complete industrial community within the hospital, wounded veterans are employed as timekeepers, foremen and laborers. A hospitalized WAC is secretary.

Patients unable to leave their beds do gauging, sorting, hand nutting and similar light work. Special light trucks and trays make handling easy.

Gainful Employment

All workers earn the same rate, 75 cents an hour, so that they may be shifted from task to task as therapy considerations may require, without difficulties over the earning rate. There are no piece work jobs, to avoid temptation to rush or overwork. All work a three-hour shift, of which there are two daily.

Officials of the co-operating concerns have reported to Capt. Max Goldenburg, M.D., in charge of the "reconditioning unit," that the production rate at the hospital compares favorably with factory output.

The conviction that they are assisting their comrades still on the fighting line is a morale-building factor, Capt. Goldenburg said.

Others of the 1750 wounded veterans now at the hospital will be given an opportunity to work when their condition permits. Similar projects have been started at the Brooklyn Navy Hospital and the Army Hospital at Van Nuys, Cal.

Wartime Washington

Royalties for Labor

John L. Lewis's demand for a ten cents royalty for his coal miners for each ton of coal produced was a logical development arising from Petrillo's victory on winning royalties from the record companies for his musicians. It had already been predicted that there was nothing to stop any union from demanding a royalty on each unit of production it had anything to do with. If Lewis won the royalty, too (it would mean $60,000,000 for his union), more such demands may be expected from other unions.

The demand represents a circumvention of the "Little Steel" formula, since it does not mean an outright wage increase, but represents a lump sum paid to a union for "benefits" of one kind or another. But what it would do to production costs and the nation's price structure can only be imagined. Meanwhile, these demands do not point to an easy avoidance of a coal strike this year, in the opinion of most observers.

SWPC Protests Contracts

The Smaller War Plants Corp. in its sixteenth bimonthly report complains that available small plant capacity in non-critical labor areas is not being adequately utilized by the services. The report referred to the Army's medium shell program, for which the Army agreed to consider some 120 plants nominated by SWPC as possible contractors. Only 26 of these received contracts, as did 26 other small plants not nominated by SWPC. However, 75 large plants received 75 percent of the total value of contracts placed, even though 55 of them were in critical labor areas.

SWPC pointed out that 78 other small plants which did not get contracts are either in non-critical labor areas, or else do not require more than nominal numbers of additional workers to do the war work.

Surplus Sales Slowed

It is reported that lack of cooperation by various government agencies and procurement officials is slowing down the disposal of government surpluses. At present, there are large quantities of tool steel, pipe, wire, and other steel available in government surpluses, even though procurement agencies are pressuring WPB to supply them with allotments for similar types of steel. It is true that in some cases analyses of the surplus steel are different than that for new military requirements, but it is said to be apparent that in many cases good use could be made of available surplus steel to the relief of the general steel situation.

But RFC's selling problems will be more difficult in many instances. At present, the agency is reported to have on hand the equivalent of four years' normal supply of music wire, which had been originally produced for Russia. What will be done with this wire is not known, and similar doubts are held on disposal of some Russian steel billets.

On January 31, 1945, the RFC had had declared to it as surplus $444,096,000 in salable property, of which $48,000,000 had been reallotted and $140,000,000 sold. To aid sales, RFC dropped its "where is, as is" selling policy and is now making warranty sales, assuring the buyer that his purchase will measure up to stated specifications.

Some observers point out that January's war production was only two percent behind schedule or $98,000,000 behind, which is a small part of surpluses now on hand. They say better procurement might have given us smaller surpluses and fewer production deficits.

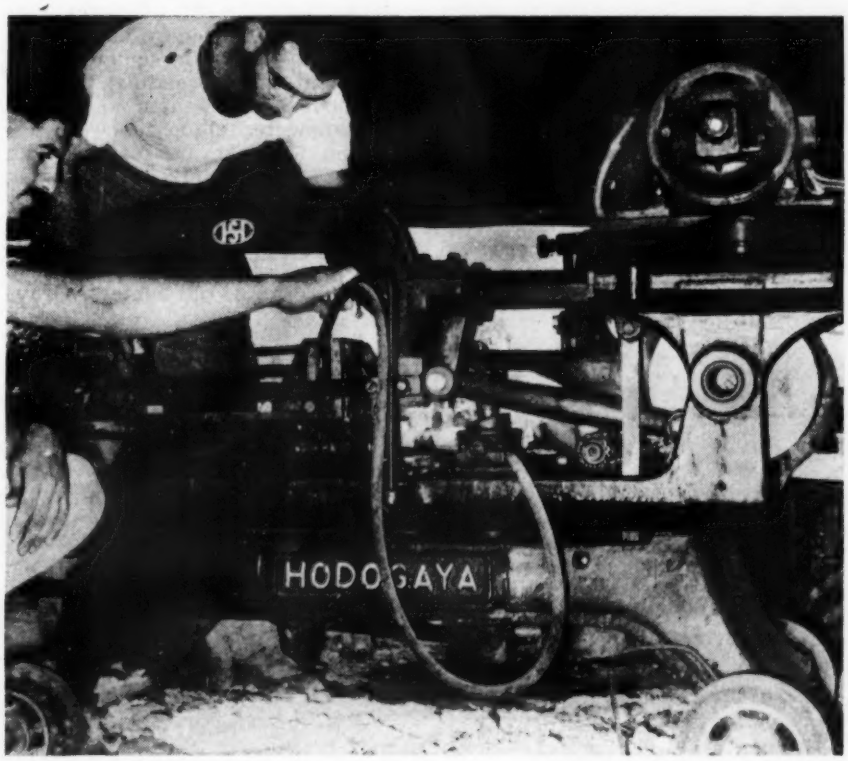
Emergency Steel Committee

WPB Chairman Krug announced appointment of an emergency steel committee, of which Hiland G. Batcheller, WPB's chief of operations, was made chairman. Mr. Krug revealed that Norman W. Foy, former chief of the Steel Division, had been recalled to Washington to help solve the critical situation.

National Debt Worries

Some congressmen who have frequently made statements of the endless limits of America's spending power nationally were brought up rather sharply when they learned national gold holdings are barely adequate to cover Federal Reserve notes by the required minimum of 40 percent and deposits by 35 percent. The Federal Reserve Board asked that the legal limit be lowered to 25 percent to permit further expansion of the National Dept.

Senator Murdock, Democrat of Utah, had an opposite viewpoint. He suggested that the price of gold be increased, so that our present gold supply would cover outstanding Federal Reserve notes and deposits. He was warned that this would upset the monetary stability of the world, and would mean dollar inflation disrupting the American economy.



Captured Jap Tool—This Hodogaya power saw was one of many pieces of Jap equipment captured from a large depot shop in Hollandia. The Fifth Air Force Service Command is putting captured tools such as this to good use. The Jap saw has a 10-in. stroke, three speeds, oil feed, automatic stop and hydro cut regulator

Spotting the Air News

P-80 Fighter Announced

The Army finally permitted Lockheed Aircraft to announce its P-80 "Shooting Star" fighting plane on March 1st because the public was muttering about German superiority in this type. Jet thrust development will feature the news from now on until production is at or near the top of the aircraft program. It is believed likely that the Japs having full knowledge of Germany's jet-turbine work and probably of America's and Britain's also will meet us in the air with their own propellerless fighters of good quality.

Jet powered planes were flown in 1941 by the British and perhaps earlier by the Germans. The United States is tag end in this field and a frank admission of that fact sounds better than the best excuses.

But being last doesn't make us least. The Lockheed P-80 was designed, built and flown in 143 days, and it probably has no superior in the world. The essential job is the engine, of course. This was designed on the basic British Whittle Engine, with improvements by General Electric, which manufactures the engines at its Lynn, Massachusetts plant. The P-80 is being produced by four Lockheed plants and by one North American Aviation plant at Kansas City.

Jet Range Increased

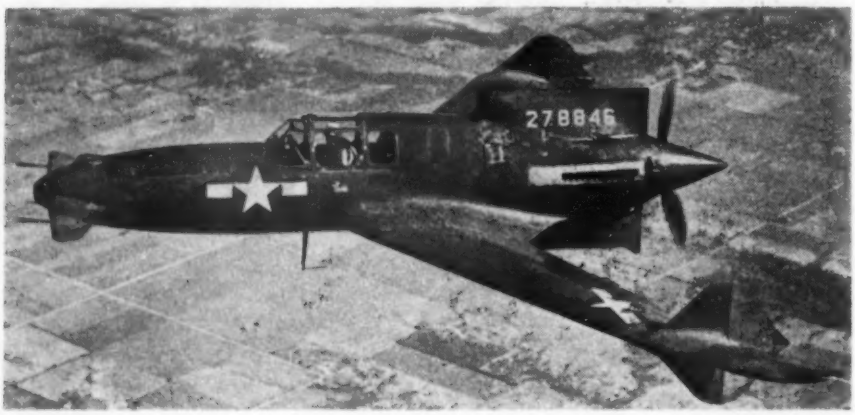
Important improvements in efficiency have already increased fuel economy to the point where the range of jet fighters is comparable with that usually required of conventional fighters. Part of the added range is given by additional fuel, however, which can be carried because the jet engine weighs only about half as much as the reciprocating type. For short range interceptor work, the lighter weight is turned into added performance.

To the advantages of speed, fast climb, smoothness, and simplicity is added also ease of maintenance. Vastly fewer tools, less time, and fewer skills are required to service and overhaul the jet engine. The G-E Jet has about one-tenth as many moving parts as an ordinary reciprocating engine of like power. It has about a dozen mounting bolts, and engines can be changed in a few minutes. A jet ship can be taken off with practically no warmup, and it cools down during the landing glide to such extent that mechanics can go to work on it immediately.

Outspeed Propeller Types

Present jet fighters can outspeed propeller-driven types in level flight. But their speed advantage is even greater in the down-hill runs from which many attacks are made, in which jet thrust efficiency increases. Over-speeding of the propeller and engine, and violent vibration, limit the descending speed of the conventional fighter.

But new techniques must be developed to make use of the high speed of jet fighters. The human organism apparently is unaffected by straight away speed. But most combat requires rapid turning, and pilots already were up to the limit of endurance in the old fighters. Gravity suits, applying air pressure to the legs and abdomen to prevent rush of blood from the brain, are now used with good effect. Placing the pilot's body prone has been tried with partial success.



Pusher-type Plane—The new Curtiss (XP-55) Ascender seems to fly backwards with its propeller in the rear and forward control surfaces and rudders near the wing tips. The Allison engine is in the rear and drives a Curtiss Electric 3-blade propeller. The plane was developed experimentally for the Army Air Forces and may not see volume output

Gas Turbines Next

Next major jet advance, in the news, probably will be the gas-driven turbine, producing thrust by both jet and conventional propeller.

California Compulsory Health Insurance Plan Being Studied

LOS ANGELES—A legislative committee has just completed a series of state-wide hearings on Governor Earl Warren's proposal that the State of California adopt a compulsory health insurance plan, financed by payroll tax of an estimated 3% that would be shared by employers and employees. Counter-proposals were submitted by certain of the interested groups, some differing from the Governor's plan in detail only.

Under the Governor's proposal all employees who are covered by the State Unemployment Insurance plan would be compelled to participate in health insurance, except for exemptions on religious grounds, and all those employees not so covered would be allowed to enter the plan on a voluntary basis. A wide variety of medical, surgical and hospital benefits is contemplated, and reimbursement to doctors rendering services would be on a free basis. A tax of 3% of earnings up to $4,000 per annum would be imposed, borne in equal shares by employers and employees.

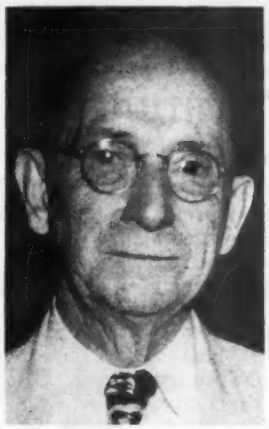
The State Chamber of Commerce has surveyed the cost of the proposed plan and has estimated the annual deficit at from $88 million to $204 million; the revenue being put at an estimated $210 million and the cost of services being estimated at from $298 million to $414 million. The Chamber estimates that 80% of California employers now provide sick leave for their employees.

Business groups further point out that imposition of a compulsory tax will mean a double burden in the case of many workers who will continue to seek medical services not provided by the plan.

Moreover, these groups maintain that imposition of the burden of health insurance tax, in addition to the taxes for workmen's compensation, old age pensions, and unemployment insurance now being collected, would place California enterprises at a competitive disadvantage, pointing out that economic and tax factors are already such as to place California industry in a difficult position insofar as postwar competition is concerned.

Names in the News

BERTRAM B. QUILLEN



Bertram B. Quillen, pioneer tool builder and president of the Cincinnati Planer Company and the Acme Machine Tool Company, died February 26th at the age of 75. Mr. Quillen was regarded as a nationally known authority on machine tools.

He began his machine tool career with Lodge and Davis Machine Tool Company, predecessor of the American Tool Works. Leaving Lodge and Davis, he founded the Cincinnati Planner Company in 1898, together with William H. Burtner and George Langen, now company vice-president. Increased business a decade later forced the company to build its own plant. By 1910 the company was established in its larger quarters on its present site on Forrer Street, Oakley.

Always interested in the welfare and best interests of his employees, Mr. Quillen established many opportunities for further education of men in his plant, recreational facilities, and friendly gatherings. Mr. Quillen's door was always open to any of his employees who desired his advice or help, and he was affectionately known by them as "Uncle Burt."

Last August, leading machine tool distributors tendered a testimonial dinner to Mr. Quillen, together with August H. Tuetcher, president, The Cincinnati Bickford Tool Co., honoring their 75th birthdays, and the fifty years of service both men had given to the industry.

Forging Die Group Joins Tool and Die Association

CLEVELAND—A group of leading drop forging die manufacturers have agreed to affiliate themselves with the National Tool and Die Manufacturers Association, according to George S. Eaton, Executive Secretary of NTDMA.

A Forging Die section of the association is planned to deal with special activities for this group.

F. R. Hoadley

Franklin R. Hoadley has been elected president of Farrel-Birmingham Co., Inc. of Ansonia, Conn. and Buffalo, N. Y. Mr. Hoadley, who has been associated with the company for over 25 years, was elected vice president and member of the executive committee in 1930. For the past eight years he has been president and treasurer of The Atwood Machine Co., Stonington, Conn., which was recently purchased by Farrel-Birmingham.

Edward J. Charlton, who since 1942 has been assistant to the president of Lukenweld, Inc., has been appointed manager of development engineering for the Lukens Steel Co. and its subsidiaries. Mr. Charlton has been with Lukenweld since 1931 when he joined the firm as a designing engineer. He continued in that capacity until 1940 when he was named general manager.

Alton P. Hall has been appointed general manager of sales of American Chain & Cable Co., Inc., with headquarters in New York. Mr. Hall joined the company about a year ago as assistant general manager of sales.

William E. Coakley, production manager for over 25 years of Pressed Steel Tank Co., Milwaukee, Wis., was recently elected vice president and director of the company.

The Aircraft Parts Manufacturers Association recently elected the following officers for 1945: President, **Hayward C. Thomas,** president of Clarke Aero-Hydraulics, Inc., Pasadena, Calif.; vice president, **F. W. Wilkins,** vice president and general manager of United Aircraft Products, Inc.; secretary, **J. D. McDonald,** president of the McDonald Manufacturing Co.; and treasurer, **Ralph Middleton,** chief engineer of the Aireon Manufacturing Co.

John H. Lease has been added to the staff of the Rees Machinery Co., Pittsburgh, Pa., to help increase service to their customers in the Tri-State area. He was formerly in the planning and scheduling department of a leading machine tool builder and associated with a large steel mill engineering firm.

John R. Cox of the Balas Collet Mfg. Co., Cleveland, Ohio was elected president of the National Screw Machine Products Association at their annual meeting in January. Mr. Cox was formerly vice president and general manager of the Weatherhead Co., Cleveland. Other 1945 officers of the Association include: Vice president, **Fred C. Phillips,** F. C. Phillips Co., Stoughton, Mass.; Treasurer, **Scott Osgood,** Curtis Screw Co., Buffalo, N. Y., and **Orrin B. Werntz** of Cleveland, Ohio.

John R. Cox

T. J. Bannan

Thomas J. Bannan has been elected president of the Western Gear Works of Seattle, Washington and the Pacific Gear and Tool Works of San Francisco, California, to succeed his father, the late P. L. Bannan, Sr. Mr. Bannan, who has been executive vice president of the companies for a number of years, is also president of the Webster-Brinkley company and the Hallidie Machinery Co. of Seattle.

Frank T. Bumbaugh has been named manager of sales, alloy division, of the Carnegie-Illinois Steel Corp. Mr. Bumbaugh had previously been assistant to the late **Frank L. Gibbons,** whom he has succeeded.

P. V. Armstrong has been appointed chief manufacturing engineer of the Martins Ferry Div. of the Blaw-Knox Co. Mr. Armstrong was formerly assistant chief engineer in charge of service and maintenance of the Euclid Cast Plant Div. of the Chase Brass & Copper Co., Inc.

S. S. Kahn has been appointed sales and advertising manager of the Parker-Kalon Corp., New York, N. Y., to succeed the late **Charles S. Trott.** Mr. Kahn has been assistant sales manager for the past 15 years.

Robert A. Trumpis, Western regional director, has been elected first vice president of the American Society of Industrial Engineers for 1945.

BUSINESS ITEMS

Farrel-Birmingham Co., Inc., of Ansonia, Conn., and Buffalo, N. Y., has purchased the **Atwood Machine Co.** of Stonington, Conn. **W. M. Fraser,** formerly vice president, has been made general manager of the Atwood plant while the engineering, production and sales services of Atwood's 93-year old organization will be maintained as formerly.

Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., has changed the name of its **Radio Division** to the **Industrial Electronics Division** to better describe its expanding functions. The division will continue under the direction of **C. J. Burnsides,** who for the past three years has headed the Radio Division.

Kaiser Engineers has been organized with headquarters in the Kaiser Bldg., Oakland, Calif. This permanent group includes qualified engineers in all major fields of engineering who have been associated with Henry J. Kaiser in his various projects. The company will undertake engineering work in any part of the world and is headed by **Henry J. Kaiser** as president; **E. E. Trefethen, Jr.,** and **T. M. Price** as vice presidents; and **George Havas** as vice president and general manager.

Hill & Knowlton, public relations counsel, New York and Cleveland has moved its Cleveland offices from 1454 Guildhall Bldg. to 323 Republic Bldg.

The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has appointed the **Ford Machinery Co.,** 1301 Toledo Trust Bldg., Toledo 4, Ohio as its agent for the complete line of LeBlond lathes, Regal lathes and cutter grinders for the Toledo territory.

The **American Welding Company,** wholly-owned subsidiary of the **American Car and Foundry Co.,** is closing its Carbondale, Pa., plant as of April 30, 1945. All equipment and the plant itself will be sold.

The American Machine and Metals, Inc., East Moline, Ill., has recently established three new district office headquarters in Dallas, Texas, Minneapolis, Minn., and the Philadelphia, Pa., territories. **Oliver H. Castle** has been appointed manager of the Dallas district with offices in the Mercantile Bank Bldg., Dallas; **G. W. Johnson** has been appointed to head the Minneapolis district sales territory with offices in the Foshay Tower Bldg.; and **Harold N. Ewertz** has been appointed Philadelphia manager with offices in the Philadelphia Savings Fund Society Bldg.

Sterling Alloys, Inc., Woburn, Mass., has appointed the **Glidden Engineering and Equipment Co.,** First National Bank Bldg., Houston, Texas, as its engineering service representative for the states of Texas, Oklahoma, New Mexico, Louisiana, Mississipi and western Tennessee.

The Eclipse Counterbore Co., Detroit, Mich., has appointed **W. E. Fry** as manufacturer's representative in the west Missouri and Kansas area. Mr. Fry's offices are located in the B.M.A. Bldg., Kansas City, Mo.

Ross & Co., 441 Lexington Ave., New York 17, N. Y., has resumed its engineering and management practice. Besides its industrial engineering activities, the firm is available for reports on special management situations such as reorganizations and business surveys.

A. O. Smith Corp., Milwaukee, Wis., has appointed **Whitehead Metal Products Co.** as eastern distributors for SMITHway welding electrodes.

The Day-Washburn Tool Co. has changed its name to **The Day Co.** and will continue to occupy the same plant facilities at 305 W. Normal Pkwy., Chicago, Ill., under the direction of **Howard Q. Day.** Metal specialties produced under the company name will now be trade-marked "Day-Co".

The **Thomas Machine Manufacturing Co.,** Pittsburgh, Pa., has appointed sales agencies in 16 major cities to handle Thomas equipment in their territory in the United States east of the Mississippi River. The agents included are: General Machinery Corp., Boston, Mass.; Giebel, Inc., New York, N. Y. and New Haven, Conn.; C. H. Briggs Machine Tool Co., Syracuse, N. Y.; W. W. Wentz, Rochester, N. Y. J. L. Osgood Machinery & Tool Co., Buffalo, N. Y.; The L. A. Benson Co., Baltimore, Md.; Smith Courtney Co., Richmond, Va.; Chandler Machinery Co., Atlanta, Ga.; George D. Miller Co., Cleveland, Ohio; Brokaw Machinery Co., Cincinnati, Ohio; Joseph Monahan, Grand Rapids, Mich.; Bryant Machinery & Engineering Co., Chicago, Ill.; Quinn & Quinn, Birmingham, Ala.; Noland Co., Chattanooga, Tenn.; Frederic & Baker, Shreveport and New Orleans, La.

The Aro Equipment Co. has appointed the following representatives in their respective territories: Bernharst-Seagle Co., Lenoir, N. C.; The C. E. Hamlin Co., Jackson, Mich; J. Y. O'Connell Co., Providence, R. I.; Schaberg-Dietrich Hardware Co., Lansing, Mich.; The Cleveland Tool & Supply Co., Toledo, Ohio; and the Lakeshore Machinery & Supply Co., Muskegon, Mich.

Best Universal Lock Co., Inc., 10 No. Senate Ave., Indianapolis 4, Ind., has moved its organization to larger quarters at 730 E. Washington St.

OBITUARIES

Ernest J. Poole

Ernest J. Poole, 48, vice president in charge of manufacturing and a director of The Carpenter Steel Co., Reading, Pa. passed away February 19 in that city. Mr. Poole graduated from the U. S. Naval Academy at Annapolis and entered the employ of the company in 1922. In 1937 he succeeded his father, E. J. Poole, Sr., as vice president upon the latter's death.

Frederick C. Chandler, 71, died February 18 at his home in Shaker Heights, Ohio. Mr. Chandler was one of the founders of the Chandler Motor Car Co. in 1913 and six years later he founded the Cleveland Automobile Co. The companies were later merged and in 1928 purchasd by Hupmobile of Detroit. Following this reorganization Mr. Chandler became active in his son's firm, the Chandler Products Corp., which he has headed since his son's death in 1942.

Morris G. Himoff, 67, secretary of the Morey Machinery Co., Inc., New York, N. Y., died suddenly February 16. Mr. Himoff has been a member of the firm of Morey Co, Inc. since its inception and was active in the development of various machines manufactured by the firm.

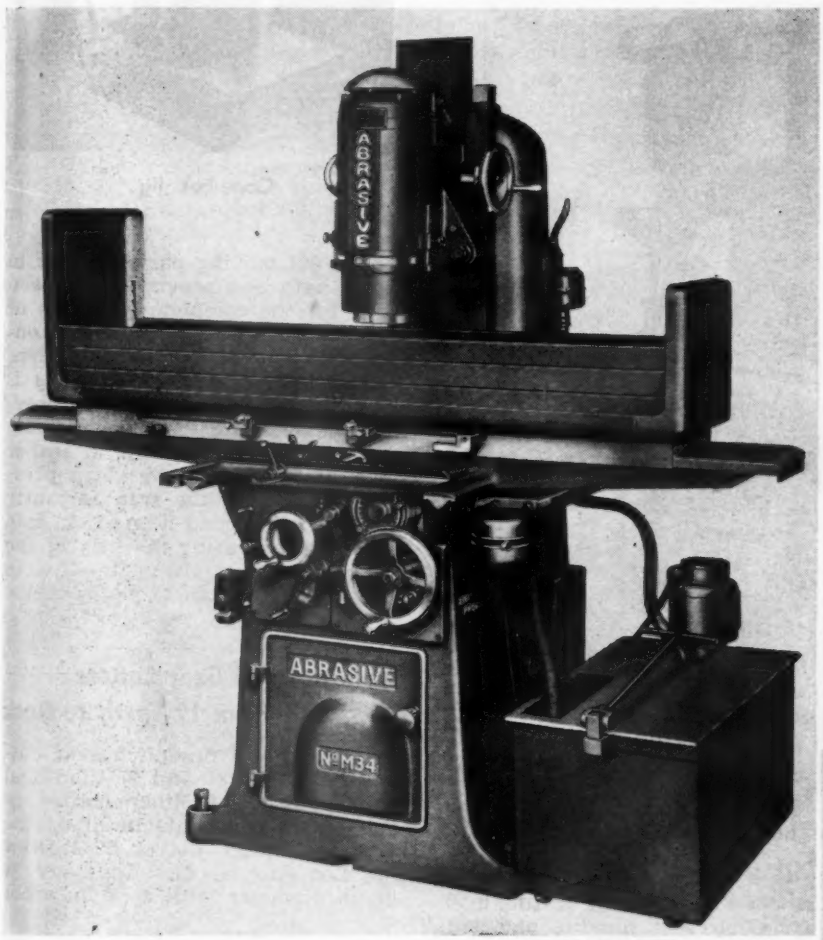
Charles F. Norton, 60, former sales manager for the Louis Allis Co., Milwaukee, Wis., died February 11. Mr. Norton, who retired in January, 1943 because of ill health, had been associated with the firm for 10 years and had previously been vice president and general manager of the Howell Electric Motor Co. of Howell, Mich.

John R. Hagemann, 44, manager of engineering in the steam turbine department of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., died February 15. Mr. Hagemann has been with Allis-Chalmers since 1929 and held a number of patents covering steam turbine equipment.

Charles R. Beall, chief engineer of the Union Switch & Signal Co., Pittsburgh, Pa., died February 24. Mr. Beall had been with the firm since 1910.

Shop Equipment News

Vertical Spindle Surface Grinder With Rotary Grinding Attachment

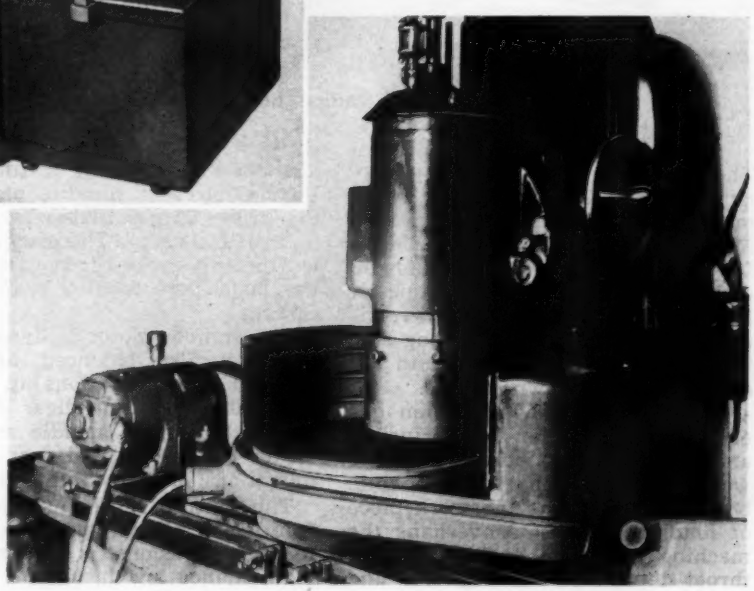


Abrasive surface grinder

The model M34 surface grinder built by the Abrasive Machine Tool Co., East Providence 14, R. I., is equipped with a Pope-SKF vertical spindle driven by a built-in 5 hp. motor. The spindle operates at 3,450 r.p.m. with 60-cycle power and 2,950 r.p.m. with 50-cycle power. The sealed spindle bearings are combinations of ball and roller bearings provided with automatic adjustments for wear and end thrust. The spindle unit is carried in a heavy wheelslide which has square vertical ways and a taper gib to take up wear. This slide is suspended on a ball thrust bearing and actuated by means of a worm and wheel, elevating screw and bronze nut. The Cortland-type wheel chuck takes a 6-in.-dia. segmental wheel.

The reciprocating table has an over-all surface of 59 in. × 10½ in. and is provided with three 9/16 in. T slots for ½ in. T bolts. The effective work surface is 8 in. by 24 in., when using the automatic traverse, with a total movement of 33 in. The table feed is provided by V-belt drive from an individual ½ hp. motor mounted in the base to a two-speed gear box. A hydraulic shock absorber coupled to the table feed drive reduces the shock of table reversal. Damage to the grinder or work pieces is prevented by a friction gear which releases the drive in the event of sharp impact on the grinding wheel.

The rotary grinding attachment is particularly suited for grinding large, flat workpieces or parts requiring grinding to be concentric with a hole or outside diameter. It consists of an individual motor-driven rotary magnetic chuck with a diameter of 12 in. A 4 step V-pulley drive on the ½ hp. 420 r.p.m. motor drives the chuck at 7, 10, 15 or 22 r.p.m. The maximum vertical capacity between the rotary chuck



Abrasive rotary grinding attachment

table top and a full size grinding wheel is 7 in.

The base of the machine is a one-piece casting having heavy ribs inside and underneath the base of the casting. All hand holes and other openings are reinforced to prevent distortion. The base rests on three leveling screws and all scraping and assembly operations are performed with the machine supported on the leveling screws. In service, the machine is leveled by these screws and their use assures perfect alignment and freedom from distortion for the life of the machine.

All moving parts, with the exception of the gear box, saddle and spindle are lubricated by a Bijur one-shot oiling system.

Floor space required is 48 by 108 in. and net weight is 3,000 lbs.

Baush Vertical Borer Adapts To Wide Range of Operations

Baush vertical borer

The model 44 vertical boring machine with an hydraulic feed worktable is manufactured by the Baush Machine Tool Co., Springfield, Mass. In operation, the work is clamped directly to the table or to special holding fixtures and moved vertically by an hydraulic elevating run. The boring tool may be fed to cut on both up and down strokes.

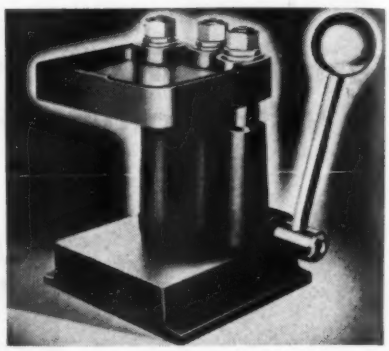
The hydraulic elevating ram operates on the center-feed principle and permits a 6-in. bore travel. The work table does not rotate while boring; this permits the work-piece or holding fixtures to overhang the machine beyond the distance of throat depth. The boring head and spindle are exceptionally heavy to minimize vibration and eliminate distortion under heavy cutting loads. Various sizes of spindles and spindle drives are available for speeds up to 10,000 r.p.m. The machine base is a heavily ribbed iron casting and the head post is also a one-piece casting.

The spindle motor is dynamically and statically balanced and will power boring operations up to 5 in. at 5,000 r.p.m. The clear distance, from table top to spindle and from center to face of head post, is built to suit customer's requirements.

The working mechanism, although fully enclosed for protection from foreign intrusions, is accessible for maintenance by means of removable panels. The maintenance openings are rigidly reinforced by webs.

Cone-Lok Clamping Jig Locks At Any Point in the Stroke

The Cone-Lok clamping jig in three types, the three-post, up-clamp and bridge types is manufactured by the N. A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 20. The jig is constructed to utilize the braking power of mated male and female

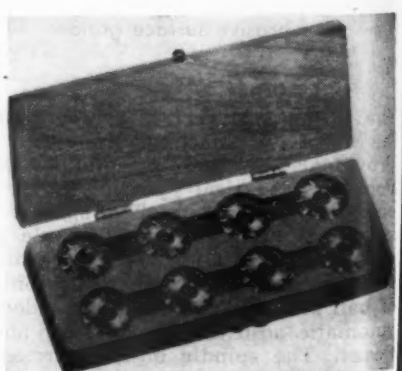


Cone-Lok jig

cones. All moving parts operate in an oil bath and provision has been made for the complete exclusion of chips and cutting oils from contact with any of the internal parts. No movement of working parts is possible without action of the operating lever. The tray is positively clamped at any location in up or down strokes and any sudden pressure applied to the tray instantly throws the second Cone-Lok into action thus securing the tray at the original position. It is supplied in sizes to suit customer requirements.

Truform Small Gear Cutters Cut From 12 Teeth to Rack

A stock line of fine-pitch gear cutters in 48, 64, 80 and 96 diametral pitches made of either carbon or H. S. steel is manufactured by the Truform Cutter Co. of 3224 Drew St., Los Angeles 41. They are ¾ in. in diameter with a ¼ in. arbor



Truform gear cutters

LODGE & SHIPLEY LATHES *at work*

MACHINING PARTS FOR WARSHIPS AT PUGET SOUND NAVY YARD

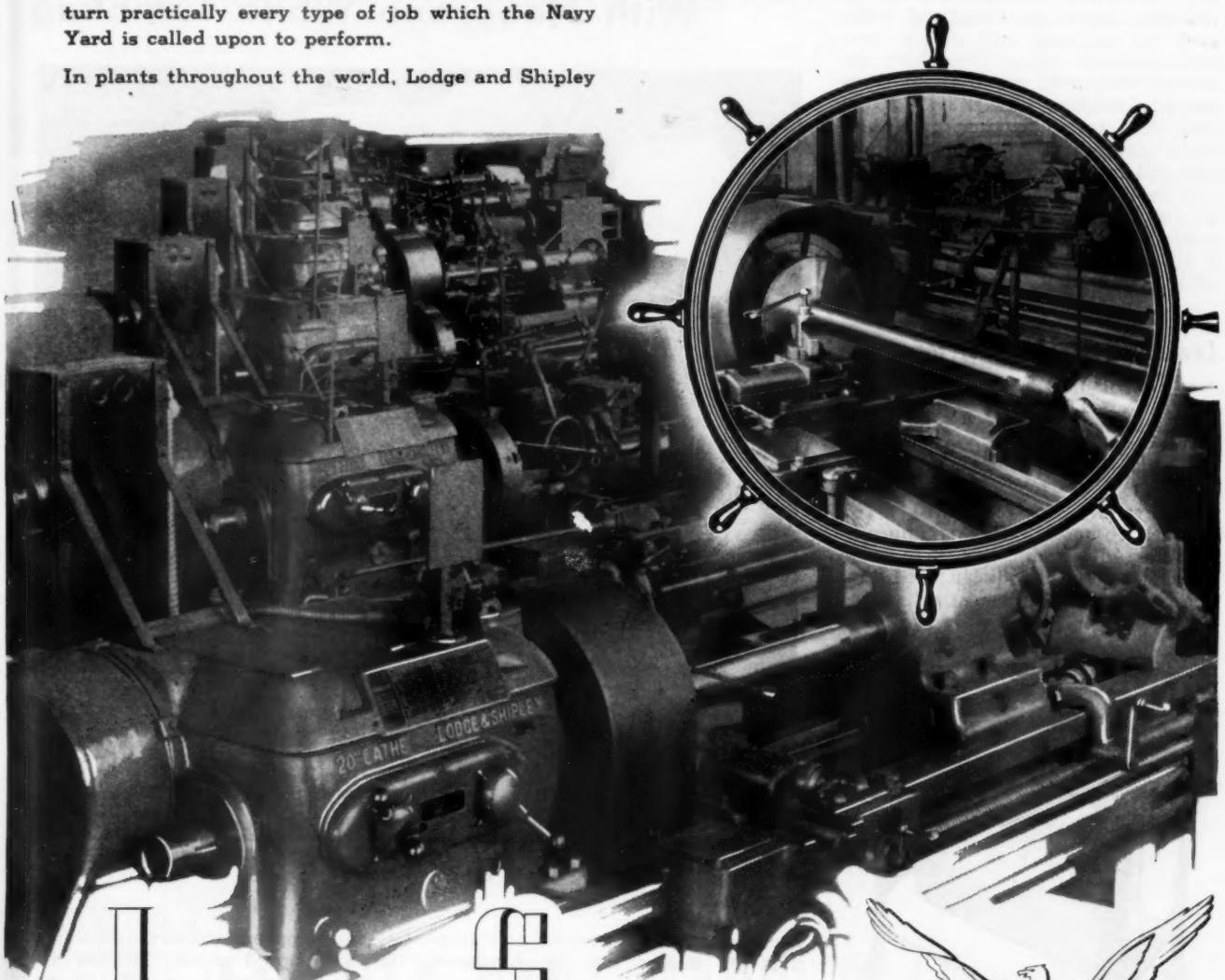
BREMERTON, WASHINGTON

The Puget Sound Navy Yard is one of the world's great naval establishments. Here, many of the nation's finest fighting ships are built and repaired. To perform this work, the Navy Yard operates its own Machine Shops—rivaling in size those of the largest industrial concerns.

Great batteries of Lodge and Shipley Lathes—from 14" to 20"—help to give this Yard a modern, highly efficient turning department. These Lodge and Shipley Lathes (within the limits of their capacity) turn practically every type of job which the Navy Yard is called upon to perform.

In plants throughout the world, Lodge and Shipley Lathes are serving with similar efficiency—reducing costs, speeding needed output, producing work of finer quality and precision. And where manpower is a vital factor, mechanical and automatic features enable the unskilled worker to handle complex jobs with ease and safety.

L and S Engineers—always at your service—are equipped to give you the benefit of 52 years of specialized lathe experience. For detailed literature on Lodge and Shipley Engine Lathes, write on your company letterhead for Bulletins Nos. 500, 503 and 605.



THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

hole and will cut gears from 12 teeth to rack.

They are available in 14½ deg. non-topping, 20 deg. instrument, 14½ deg. topping and epicycloidal tooth profiles.

Electrode for Heavy Welding Provides High Melting Rate

A heavily covered arc-welding electrode, type W-27, which provides an exceptionally high melting rate for flat and horizontal fillet welding as well as for flat butt welding, is manufactured by the Electric Welding Division of General Electric. It is designed for use wherever weld requirements include high mechanical properties, rigid X-ray examination, high deposition rate and good profile and surface. The applications of this electrode include pressure vessels and pertinent connections, heavy machine bases and structural parts such as columns and plates, roof trusses, beams and girders where the section thickness permits. At comparable welding speeds it requires less heat input to the joint than other electrodes; this reduces warpage and internal cooling stresses.

It is suitable for operation with a.c. or d.c. with either straight or reversed polarity. It is available in 3 sizes 3/16, 1/4 and 5/16 dia., in 18-in. lengths.

Lewis Roe Dry Tumbler for Polishing Smaller Parts

A small dry tumbler driven to 40 r.p.m. by a ¼ hp., 110 volt a.c. motor is a product of the Lewis Roe Mfg. Co., of 1050 DeKalb Ave., Brooklyn 21, New York City. The octagonal wood barrel is approximately 14 in. in dia. and 24 in. long. The motor, speed reducer and barrel are mounted on an iron stand.

Lewis Roe tumbler

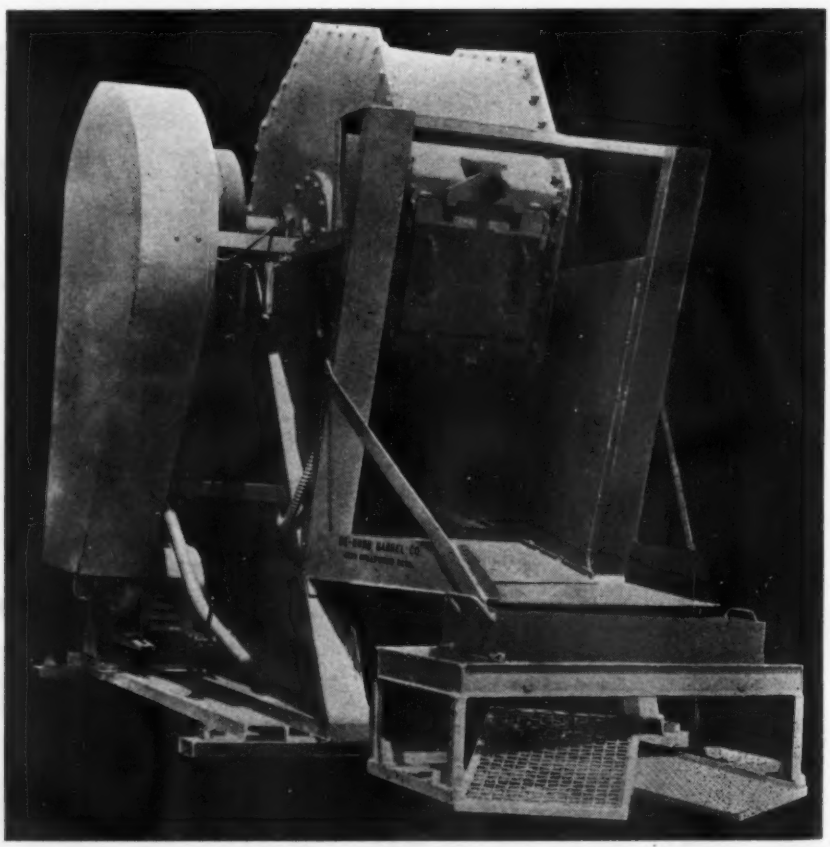
Interchangeable Type Holder Eliminates Roll-Type Jumping

A wedging action is obtained by an angle groove in the marking dies, which mates with a beveled ring on the type-insert retaining cover, of an interchangeable roll-type holder developed by New Method Steel Stamps, 147 Jos. Campau, Detroit 7, for use with automatic roll-marking devices. It permits interchangeable type inserts to be held more firmly in position than is usually possible with a square or rectangular groove; this feature eliminates type chattering and increases type life.

When small sizes of type are used, the beveled groove assists in maintaining type strength as a minimum amount of metal is removed. The wedging action is sufficiently strong as to eliminate the need of filling the entire type opening with characters or wedge blocks.

New Method type holder

De-Burr Process Cushions Parts With Neoprene While Tumbling



De-Burr machine

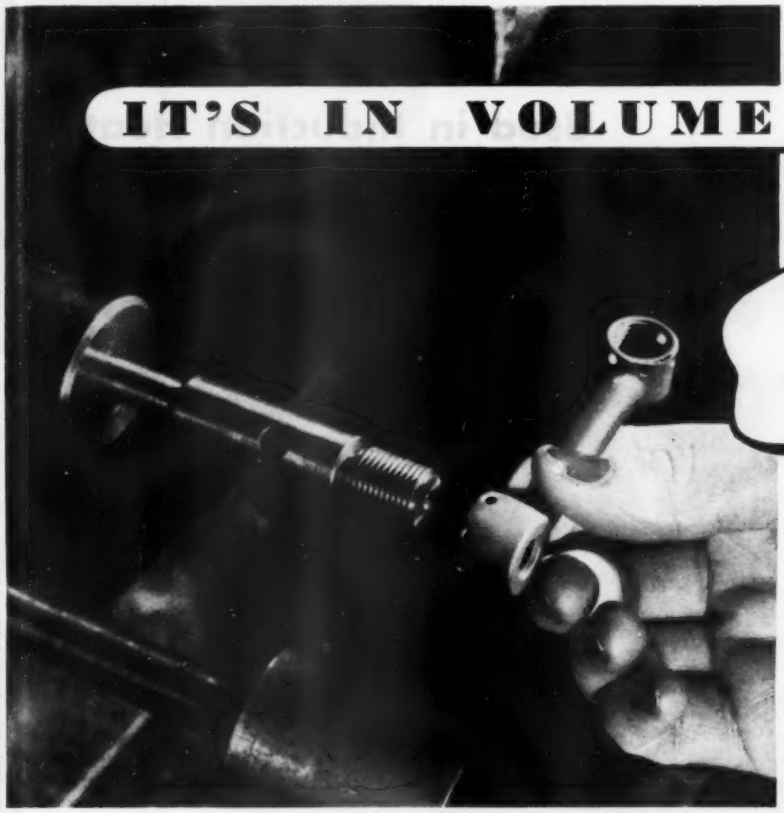
Precision machined parts and stampings of either soft or hardened metals are deburred and given a smooth overall finish by the De-Burr machine and process of the De-Burr Barrel Co., 4579 Hollywood Blvd., Los Angeles 27.

The De-Burr machine is equipped with a 40 in. dia., 16 in. width, octagonal steel barrel, fully lined with ¼ in. Neoprene rubber and driven by a 1 hp. 3 phase, 220/440 volt motor. A variable speed reducing unit with attached shockproof torque arm permits speed ranges of 8 to 22 r.p.m.

The De-Burrettes used in the machine are abrasive carriers made of Neoprene. The abrading material, aluminum oxide, is impregnated in

IT'S IN VOLUME INSPECTION

WHERE GAGE *Wear Resistance* PAYS DIVIDENDS



A modern inspection method, illustrated at the left, employs the use of a reversible tapping head which holds a Lincoln Park Carboloy Thread Plug Gage. The part to be inspected is fed to the gage. This method of volume inspection has shown remarkable time and labor savings.

WHEREVER Lincoln Park Carboloy Thread Plug Gages have been used for volume inspection of threaded parts, they have definitely proved their lasting accuracy and economy in use. Today, hundreds of inspection operations on aircraft parts, projectile components such as fuse adapters, and innumerable other mass production parts, have been performed with tremendously increased efficiency by the use of these wear-resistant gages.

In the method of inspection shown above, as an example, only a Lincoln Park Carboloy Thread Plug Gage fully meets the requirements of the operation. In this case, the gage is subject to more than average wear and abrasion. In spite of this, the gages used retain their accuracy almost indefinitely, seldom requiring replacement. In the more conventional methods of volume inspection, too, these thread plug gages prove equally as efficient.

Lincoln Park Carboloy Thread Plug Gages are supplied in a standard size range from a No. 4 machine screw size to 3" diameters to meet almost any specifications for tolerance, lead or pitch. They can be delivered promptly. Write for full details.

LINCOLN PARK *Carboloy* THREAD PLUG GAGES

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

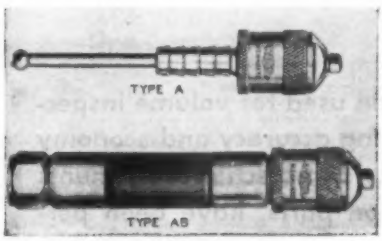
1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

the rubber chunks and cushioned to prevent deep abrasive penetration. The constant pressure of the evenly distributed, cushioned abrasive scours the entire surface of parts subjected to the treatment. This gentle but effective action permits the maintenance of 0.001 in. tolerance for metal-removing. The depreciation of the De-Burrettes due to loss of the abradable material, Neoprene, averages 1 percent of total mass in 24 hr. of operation.

Trico Air Control Valve Operated by Flexing Hose

A leakproof air gun for blowing chips, dust, dirt, kicking out unfinished parts and controlling air tools is produced by the Trico Fuse Co., 2948 N. Fifth St., Milwaukee 12. A slight "finger tip" flex of the attaching hose discharges a small puff or a full blast of air as desired.

Levers, buttons, gaskets or glands are eliminated by the ball and socket valve joint which has only two moving parts. The valve is held closed tightly by air pressure when the valve is released. Type A is recommended for permanent installations in air supply hoses. Type AB is recommended for remote control applications. It is attached directly to the air supply pipe and operated by hand, foot or mechanical control. Both types are manufactured in sizes to fit all hose diameters.

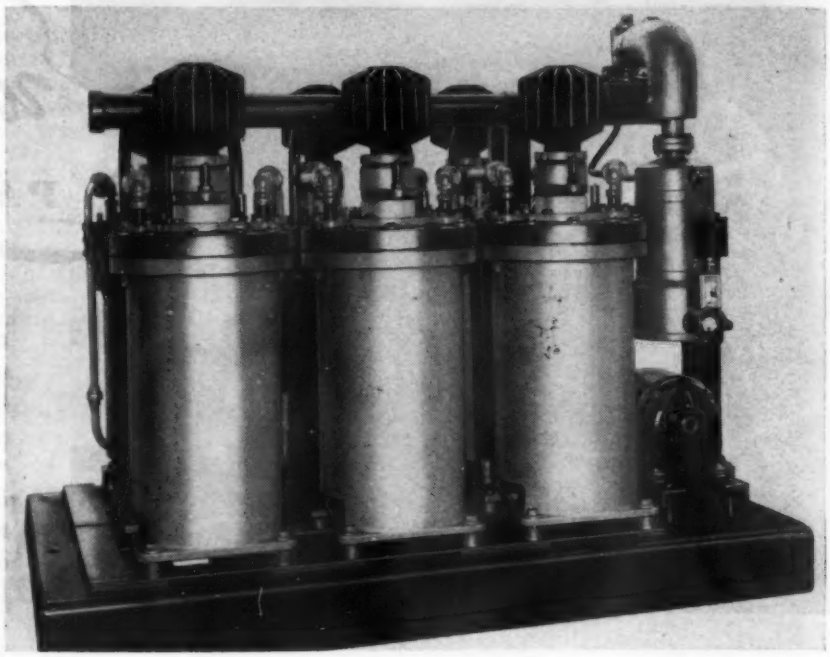


Trico air guns

Dilley Magnetic Grip Shield Eliminates Need for Goggles

A safety device intended to eliminate the necessity for goggles and face shields in many machine tool operations is manufactured by the Dilley Mfg. Co., 10110 Euclid Ave., Cleveland 6. The Magnetic Grip Shield consists of thick sheets of transparent plastic fastened to a permanent magnet. It may be positioned as necessary on any convenient ferrous metal part of the machine. Sizes range from 3 × 4 in. to 8 × 10 in. in the flat types and a hood type is provided if required.

Allis-Chalmers Excitron Converter Used in Induction Heating



Excitron converter

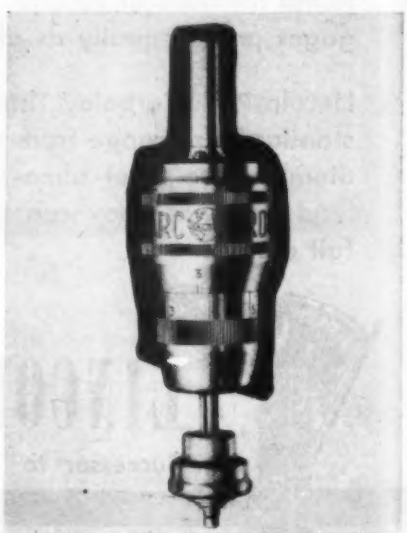
Designed for the purpose of electronically changing power at commercial frequencies of 60 or 25 cycles to 1,000 to 2,000 cycle power, the Excitron mercury arc converter manufactured by Allis-Chalmers, 1941 Ristow St., Milwaukee, is suitable for supplying power for induction heating of large masses of metal, in forging, melting and metal-treating operations requiring kw. capacities of 1,000 and higher.

Two field tests of the Excitron mercury arc converter; one a 300 kw. unit in a forge plant and another a 250 kw. unit installed in a brass foundry, have showed the units to perform at higher full and partial load efficiencies than other types of converters operated at equivalent frequencies.

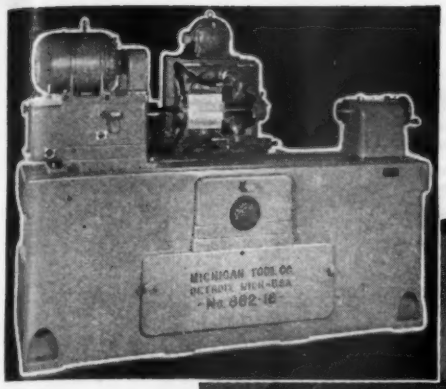
The units are quiet in operation and, being water-cooled, require no air filtering or ventilation. The vibration of the Excitron converter unit is negligible, eliminating the need for excessively heavy foundations.

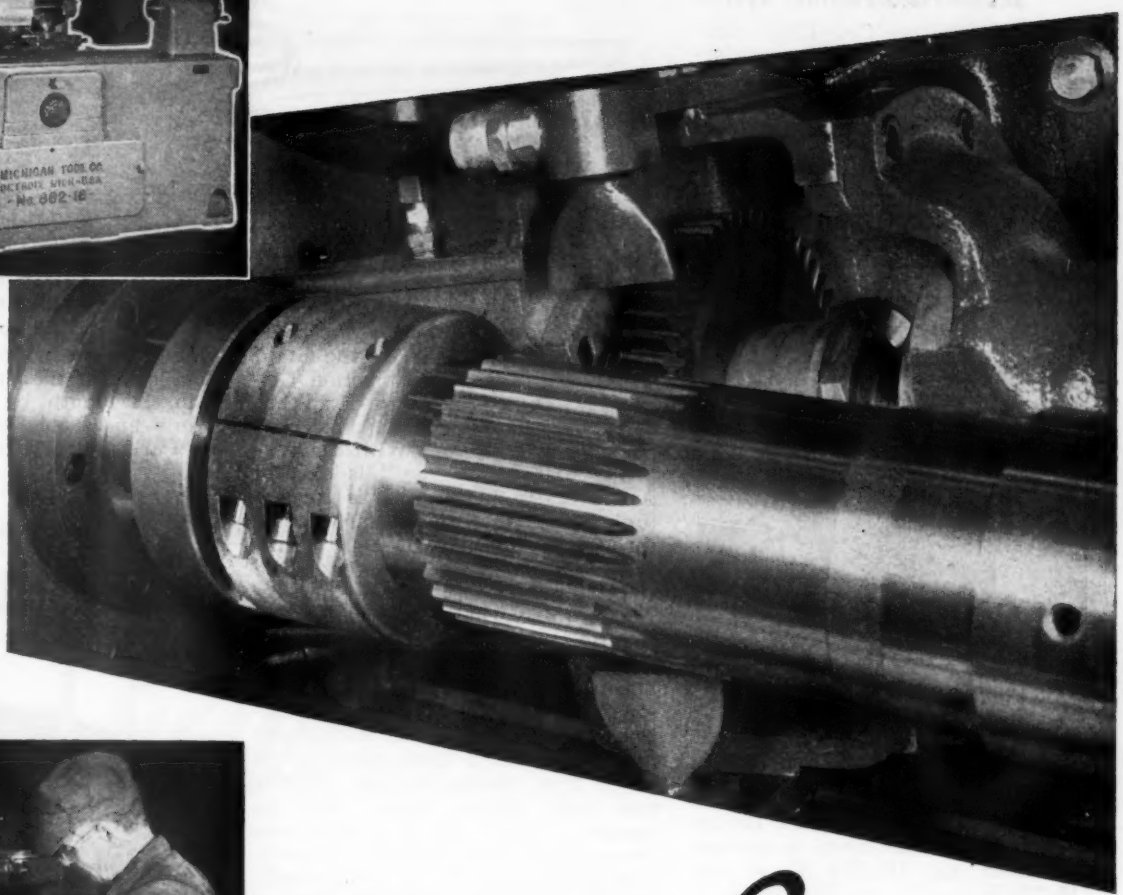
Internal Grooves Cut with Drill Press and Truarc Tool

The Truarc internal grooving tool manufactured by Waldes Koh-I-Noor, Long Island City 1, N. Y., can be used with any lathe, boring mill or ordinary drill press. The tool is inserted in the machine and used in the same manner as a drill; pressure on the tool causes the cutter to advance into the side of a bored hole, or other cylindrical cavity, cutting a concentric groove. The position of the groove is adjusted by sliding the movable head up or down. The setting of the vernier adjustment on the head determines the depth of the groove. The pilot housing is held in a ball bearing seat to prevent rotation and marring of the work surface. The tool is made in four sizes to fit housing bores of ⅜ in. to 5½ in.



Truarc interval grooving tool





Finishing a large high-precision spline (right) on Michigan #862 (above) rotary gear shaving machine.

(Below) Producing zero-backlash splines on a Michigan #900 rack type gear finisher.

Involute Shaving

MEANS BETTER SPLINES AT LOWER-COST

Involute splines are today rapidly becoming accepted practice in many applications. Among the reasons are: they are stronger, have no sharp corners, have more contact under load and better load distribution; fits can be varied using the same hob without affecting bearing area.

Further, since involute splines are merely wide face gears, they can be finished by *crossed-axis shaving,* cutting production time and costs, assuring the highest possible degree of accuracy.

Here are shown two sizes of such splines—both requiring the highest degree of accuracy, with virtually zero backlash—being finished on Michigan gear finishers—a large involute spline shaft on a Michigan Model #862 rotary and a smaller mass production spline on the Michigan #900 rack type finisher.

For information on this process and the machines available for such work, ask for Bulletin #GF-43.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

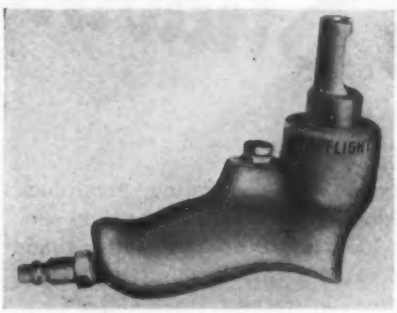
7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

Low-Temperature Hot Pot Has Sealed-Fluid Heating System

The Kindt-Collins Co., 12651 Elmwood Ave., Cleveland, manufactures a controlled temperature pot for heating waxes, fusible alloys and low temperature plastics. It is electrically heated and is fire and explosion proofed. The heating element, thermostatically controlled to a range of 142 to 162 F., operates in a vacuum sealed fluid which circulates between the outer and inner shells of the pot. This assures equal heat transfer to all parts of the pot cavity. The pot is supplied with a two-quart cavity, 6¾ in. dia., 7⅜ in. deep, to operate on either a.c. 110/220 V. or d.c. 110/220 V.

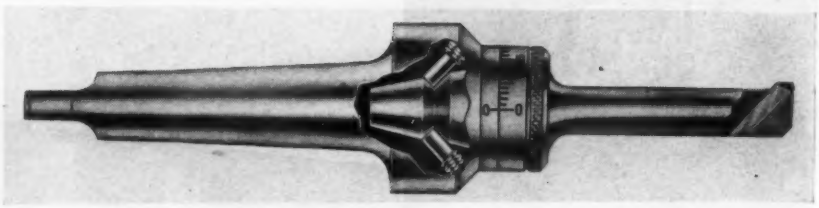
Kindt-Collins melting pot



Topflight skin plier

Pneumatic Plier Speeds Insertion of Metal Fasteners

An air-operated plier for sheet metal fasteners such as Cleco, F & H and similar types insures full insertion of the fasteners and eliminates the hazard of weakly held fasteners flying from a manually operated plier. The Topflight Tool Co., Chestnut Ave., Towson 4, Md., has conducted tests to prove use of the tool saves ½ to 1/3 the time required to insert and remove fasteners manually. The elimination of operator effort to compress the fastener spring reduces fatigue and hazard.



Dial-set boring tool

Dial-Set Boring Tool Has Micrometric Adjustment

Micrometric adjustment of the Dial-Set boring tool, made by the State Manufacturing & Construction Co., 1940 N. Dixie Highway, Franklin, Ohio, is accomplished by an eccentric cone and socket. With the vernier set at 0.0 the quill is exactly centered; as the vernier is turned, the quill is thrown off center through graduations of 0.001 in. increases in boring diameter. The maximum increase obtainable by use of the vernier is 0.050 in. As the bit is held in the quill by a setscrew, a secondary increase in boring diameter can be effected by extending the bit. The combination of micrometer and bit adjustments permits a total range of ⅜ in. to 2 in. boring diameters. The tool will bottom holes, bore to square shoulder and accurately bore intermittent cuts. Despite its precision of adjustment, the tool is sufficiently strong for heavy production work on boring machines. The Dial-Set tool is manufactured in a wide variety of styles and sizes to meet individual requirements.

Spacing Block Improves Use Of Numberall Rotary Stamp

The new Numberall spacing block has been designed to assure correct alignment and spacing of characters used on nameplate details. With the nameplate beneath the guide, the Numberall Rotary Stamp is placed in the guide slot and moved along the guide for stamping.

The block is manufactured for various sizes of nameplates from 1 to 6 in. in length by the Numberall Stamp and Tool Company, Huguenot Park, Staten Island, New York.

Numberall Stamp and Guide

Lyon cart

Lyon Parts Cart Uses Desk Attachment for Inspectors

A heavy duty push-cart intended to save steps and excess material handling in toolroom, assembly and shipping operations is made entirely of steel by Lyon Metal Products, Aurora, Ill. It is 30 in. long, 16 in. wide and 32 in. high overall.

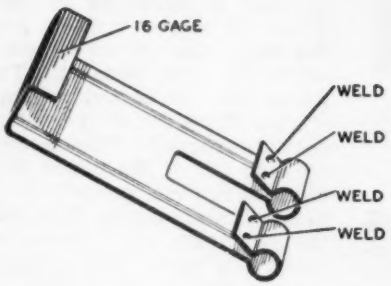
It can be equipped with an extra center tray for small parts or a desk top to convert to a portable inspection station. The cart is finished in Lyon green baked enamel and is shipped set up and crated.

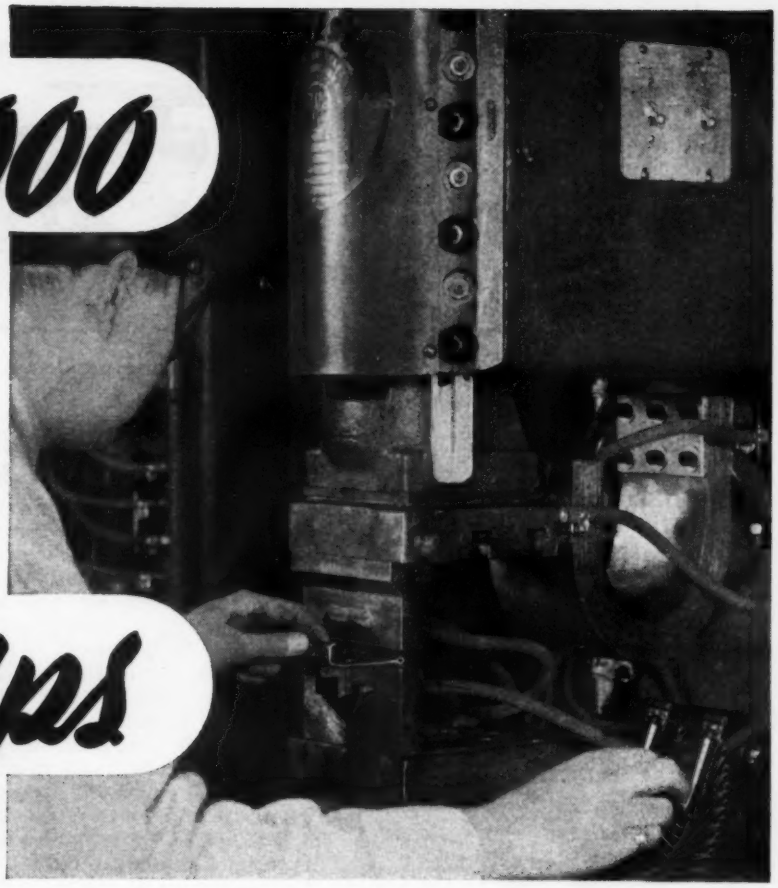
Acme Anvil Blocks to Reduce Wear of Instrument Anvils

It is claimed that anvils of comparators and similar measuring instruments can be protected against wear by Acme Anvil Blocks, a product of the Acme Industrial Company of 200 N. Laflin St., Chicago 7.

According to the manufacturer, the Anvil Block can be wrung to any serrated or flat anvil and it will adhere firmly. They are lapped flat and parallel to within a few millionths. Standard size is ½ in. by ½ in. by 1⅜ in.

Welds 2000 Steel hasps per hour





That's the job one PROGRESSIVE projection welder has been doing, hour after hour, day after day. The unusual output rate, without requiring automatic loading, is made possible by two things:

1. The positive and consistent operation of PROGRESSIVE equipment.
2. Designing the part and dies so that locating and clamping is unnecessary.

Four small projections are stamped into the metal near the hinge eyes in the forming operation. To secure the eyes, the hasp is merely laid on the lower die of the welder. The upper die comes down, current comes on automatically, and welds the eyes closed at the projections.

In projection welding, accurate locating with reference to electrodes is usually unnecessary. Frequently simple flat welding dies can be used. An air hose coupled to a solenoid valve blows the part off the die into a basket when the operation is completed and the machine head raises.

PROGRESSIVE field engineers, backed by a greatly expanded staff of design and application engineers selected from the resistance welding industry for their breadth of experience and "results", will be glad to help you simplify and speed up your assembly and welding operations.

ARE YOU RECEIVING PROGRESSIVE'S "WELDING PICTORIAL"?
Ask for it on your Company Letterhead.

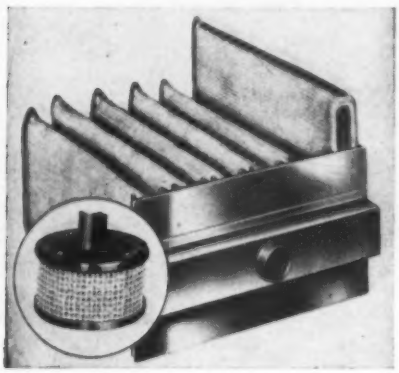
PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

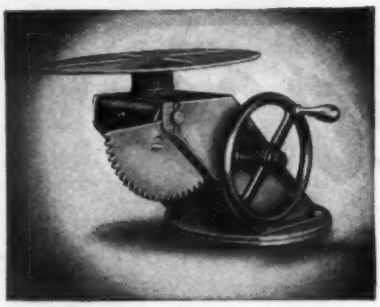
Metex Strainers for Flood Oiling and Coolant Systems

The Metex strainer, used on machine tools for straining cutting oils and coolants and for other installations requiring flood oiling, is a product of the Geo. Butler Co., 1057 W. Washington Blvd., Chicago. The unit requires no strainer housing; it is installed in the tank and the oil or coolant is directly piped to the pump. Strainer units are a combination of wire and cotton, interknitted in a mesh. This construction forms a strong, non-collapsible unit. All of the Metex strainers have a large area. Exceptional capacity to filter dirt, grit and chips can be provided in the larger units



Metex strainers

where there is sufficient space for installation. They are supplied in sizes rated from 2 to 60 g.p.m. for use with all commercial grades of lubricants and coolants.



Ransome positioner

Bench Model Positioner Tilts 150 Deg., Revolves 360 Deg.

A hand-operated positioner to facilitate work handling in assembly, grinding, drilling, welding and similar operations on small workpieces is manufactured by the Ransome Machinery Co., 1407 South Ave., Dunellen, New Jersey.

The capacity of this bench model positioner is 100 lb., with the center of gravity 3 in. above the table. It has a tilting range of 150 deg., revolves horizontally 360 deg. and can be locked in position at any degree of tilt.

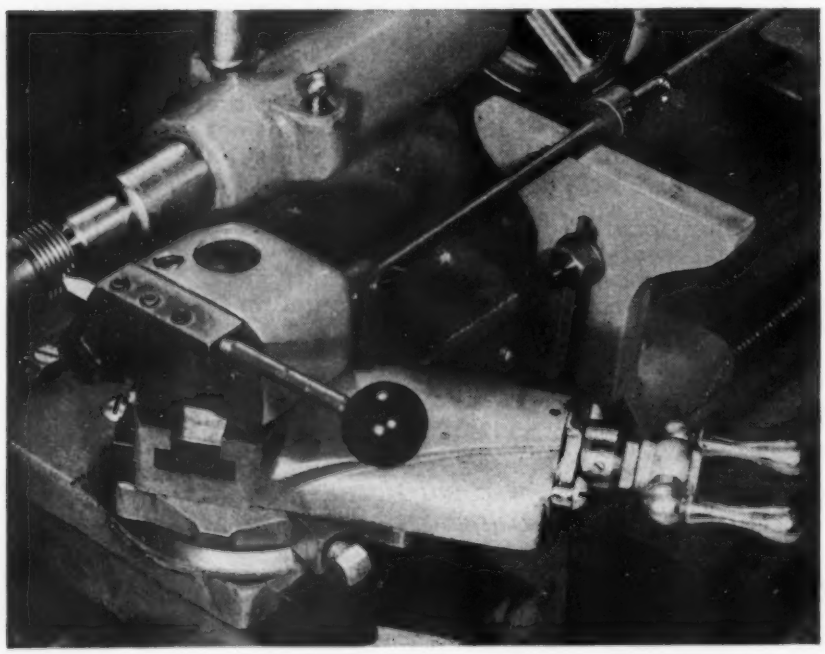
The 16 in. dia. table is slotted 9/16 in. for holding bolts.

Retracting Toolholder Speeds Lathe Operations

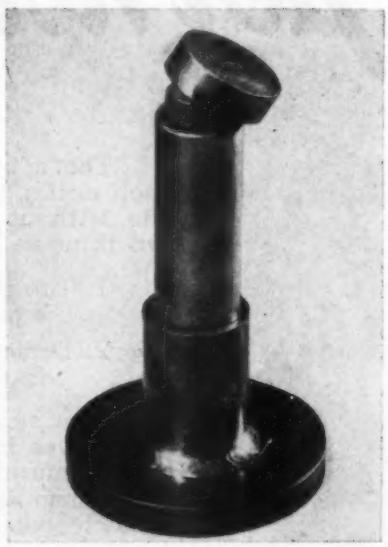
A lathe toolholding device which automatically retracts, by a snap action, a turning, chasing or boring tool out of internal or external lathe cuts at any predetermined point is manufactured by The Faulk Engineering Co., 4208 Airport Rd., Cincinnati.

The Retract-A-Tool consists of a toolholder and body, a stop bracket and an interconnecting trigger rod. The toolbody is set on the topslide in the position normally occupied by the toolpost and the stop bracket clamped to the ways. After the carriage is advanced to the point where the toolbit is to be retracted, the stop collar on the trigger rod is set to the stop bracket. The tool thereafter will be automatically retracted whenever the predetermined point is reached. This action snaps the tool out of the cut at the same place each time, permitting threads to be chased up to a shoulder or to the beginning of a taper without turning a neck. In a long blind hole, a chasing bit can be run in at full speed, with assurance of a full thread, without grounding the bottom of the hole.

The Retract-A-Tool can be set up as easily as a toolpost bit and is therefore useful in toolroom as well as production applications. It is made to fit all standard bench lathes and is also applicable to many turret lathes.



Retract-A-Tool



Jominy specimen holder

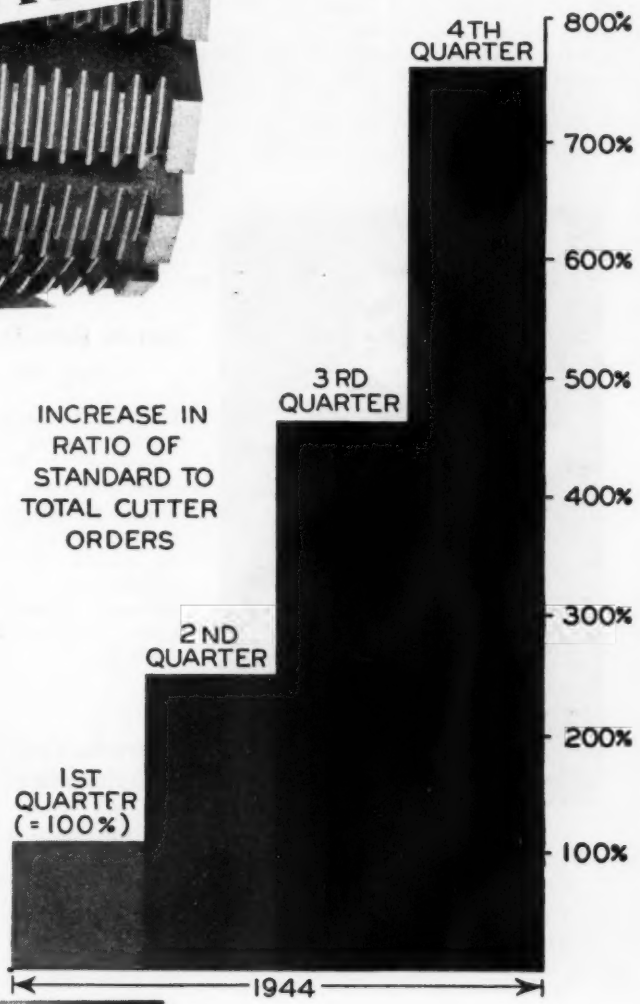
Jominy Specimens Heat-Treating Holder Developed by Gordon

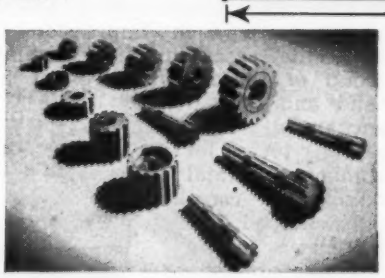
A holder for Jominy end-quenched hardenability test specimens is manufactured by the Claud S. Gordon Company of 3000 So. Wallace St., Chicago 16. The holder consists of a stainless steel shell and cap. The specimen is placed inside the shell and heated. After heating, the shell is placed in a base assembly and removed with tongs and quenched. It is claimed this holder simplifies the preparation for joining tests and prevents scaling of the specimen.

THREAD MILLING CUTTERS GO STANDARD

The story of how industry during 1944 took to the idea of specifying STANDARDIZED thread milling cutters, ground from standard blanks, carried in stock, is one of the big thread-production stories of 1944.

Introduced by Detroit Tap and Tool Company initially as an "expedient" to speed up deliveries (*) of thread milling cutters, these standardized-design tools are rapidly becoming standards of industry. Blanks for such cutters are carried in stock finish machined and heat-treated, ready for thread grinding. All that is necessary is to specify the thread desired and the blank number, saving time not only in delivery but also in preparing to order.





We will be glad to send you a Bulletin showing standard blank sizes and types carried in stock and giving complete ordering information. Ask for Bulletin No. CB-43.

*Despite the rapidly increasing demand for such tools, delivery time on Standard cutters was actually less at the end than at the beginning of 1944.

• THREAD HOBS & SPECIAL THREADING TOOLS •

DETROIT TAP & TOOL CO.

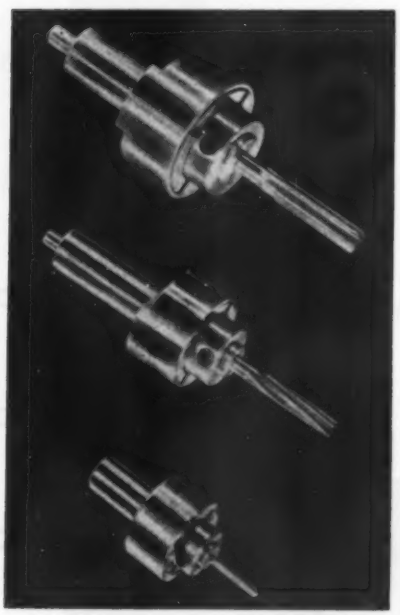
• GROUND TAPS, THREAD GAGES SPECIAL TAPPING MACHINES •

8432 BUTLER AVE. DETROIT 11, U.S.A.

Floating Reamer Chuck for Automatic Screw Machines

The Green reamer holder is a floating chuck for holding reamers on automatic screw machines. The floating action is obtained by means of two synthetic rubber rings that allow a free but controllable motion in any direction including lateral as well as pivotal motion; this permits a smooth hole, round and free of chatter marks and bell mouth, to be cut by the reamer.

The Green Mfg. Co., Rockford, Illinois, uses synthetic rubber, as the supporting ring material, that is impervious to cutting oils. There are no mechanical parts in moving contact to wear or interfere with the normal action in the device. With all movement of the reamer body and the reamer chucking.

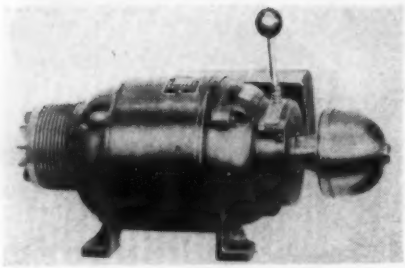


Green reamer chuck

head absorbed by the resilient rubber rings, shock on the reamer cutting edge and any tendency to chatter is eliminated. A hollow set screw fixes the reamer position and a spanner wrench adjusts the tension of the float action. Both adjustments can be made with the holder in the machine.

Crozier Vacuum Grip Lathe Polishes Parts Hard to Chuck

Parts such as oil can bodies, spun shapes and flat stampings which cannot be conveniently held by a chuck or collet are held for polishing operations by the vacuum chuck of the Crozier Lathe manufactured by the Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Cal.



Crozier polishing lathe

The vacuum, created by an exhaust pump mounted at the rear of the lathe motor, is brought to the chuck through the hollow shaft eliminating the need for exterior piping or glands. The lathe starts, holds the work, stops and releases by means of the single lever control. It is furnished with a threaded spindle 1 in. -8 on an 1,800 or 3,600 r.p.m., 220/440 or 550 volt 3 phase 50/60 cycle motor.

Natvar Extruded Insulating Tubing Oil and Heat Resistant

Improved resistance to heat, oil, gasoline and benzol are features ascribed to Natvar 400, extruded plastic tubing, by its manufacturer, National Products Corp., Woodbridge, N. J. Its tensile strength is in excess of 3,000 psi., with an elongation from 170 percent, to 10 percent, depending upon formulation. It remains flexible down to —80 F.

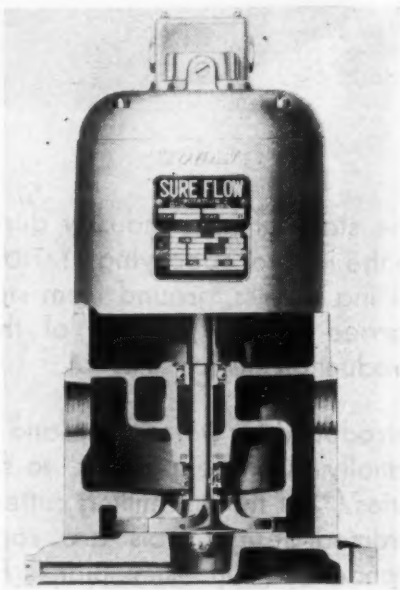
Gottscho Case Numberer to Automatically Change Numbers

An automatic case numberer that in the standard model, imprints three digits, the word "of" and three more digits is manufactured by Adolph Gottscho Inc., 190 Duane Street, New York 13.

The first group of three digits will change consecutively or in duplicate with each impression to show the case number; the last group of three digits are set by hand and remain unchanged, indicating the lot number or total number of cases to be shipped. The automatic case numbers are furnished in three character sizes: 1 in., ¾ and ½ in. Triplicate or quadruplicate character action can also be supplied if desired.

Logan Pump Handles Fluids Loaded with Abrasive Grit

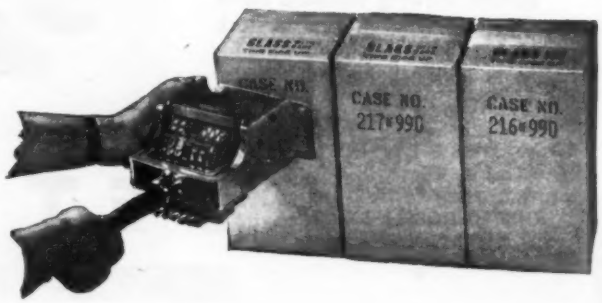
Designed especially for pumping coolants and cutting oils, the Logan Sure-Flow pumps are adaptable for most liquid transfer applications. The open-type impeller eliminates metal to metal contact of moving parts and allows liquids containing abrasives, filings and other foreign matter to be pumped without damage to the pump. The manufacturer, Logansport Machine Co., Logansport, Indiana, equips all of the 27 models and types available with an integral motor drive. This permits greater latitude in locating the pump as no gears, chains or other forms of mechanical drive are necessary. The models intended for base or bracket mounting are self priming without submerging; they can be installed at any convenient



Logan Sure-Flow pump

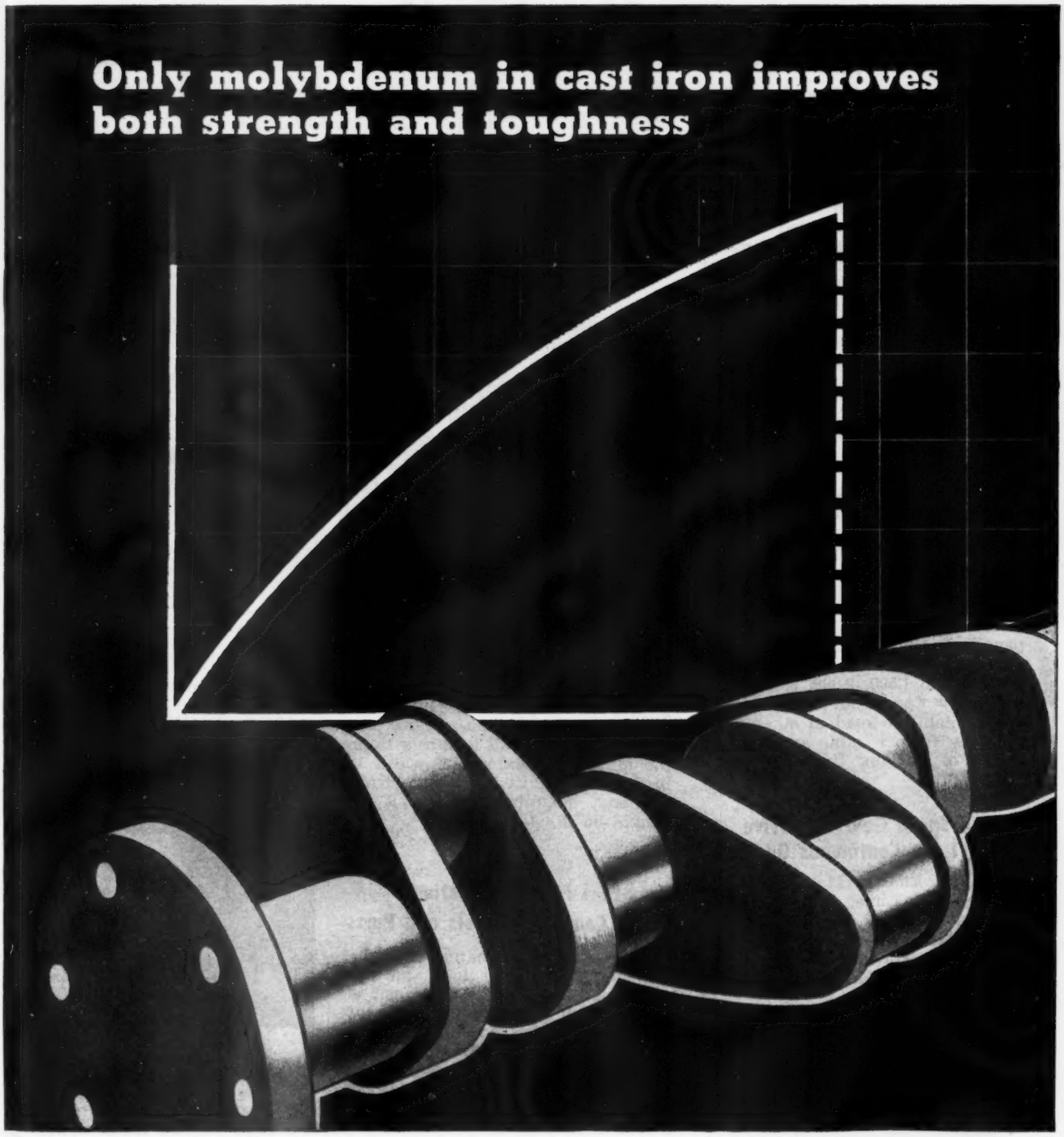
point above, below or at a remote point in relation to the liquid to be pumped.

The drive motor is a totally inclosed ball bearing type, protected against splashing liquids, abrasive dust and other harmful elements.



Gottscho case numberer

Only molybdenum in cast iron improves both strength and toughness



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

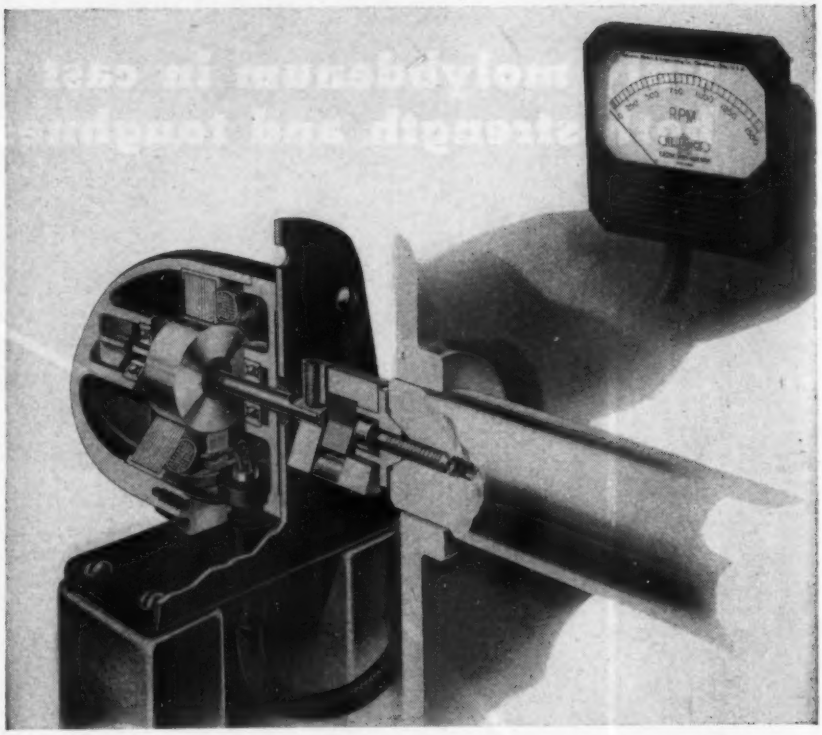
500 Fifth Avenue · New York City

MOLY

Reliance Electric Tachometer With Remote Speed Indicator

An electric speed indicator developed by the Reliance Electric & Eng. Co., Cleveland, Ohio, indicates speeds from 100 r.p.m. to 5,000 r.p.m. The device consists of two units. The pick-up unit, a miniature six-pole alternator with a permanent magnet rotor, is mounted on the shaft of which speed is to be measured. The indicator, a permanent magnet, moving coil type, meters the pick-up output on a 3¾ in. scale which covers an arc of 95 deg. The resistance of the indicator has been made high, so that the size or length of the leads connecting the units will have no effect on accuracy. The indicator can be located at any distance from the pick-up unit. The indicator is not affected by other magnetic material and there is no loss of accuracy due to length of service life.

Instantaneous or continuous indication is independent of the direction of shaft rotation. Pick-up windings are stationary and there are no commutators or slip rings. The indicator may be bracket or panel mounted. Indicators are provided for full-scale deflection corresponding to 1,500, 2,000, 2,500, 3,000 and 5,000 r.p.m. and special scales are available to read in other units such as ft. per min. and process cycles of varying times.



Reliance electric tachometer

Lima 4 Speed Gearshift Drive For 1 Hp. Continuous Operation

The Lima Electric Motor Co., 1501 Findlay Rd., Lima, Ohio, manufactures a compact 4 speed machine tool gearshift drive designed to provide power for machine tools and other equipment requiring motor capacities of 1 hp. or less. The unit is designed for continuous operation capacities of ½ and ¾ hp. at 1,200 r.p.m. and 1 hp. at 1,800 r.p.m.

Lima gearshift drive

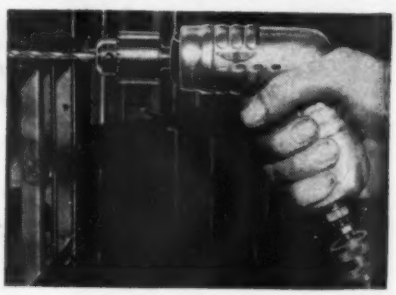
The gear ratios of this unit, type R, are 1 to 1, 1.33 to 1, 2 to 1 and 4 to 1. Shifting is done by means of a small lever which can be extended to any convenient position.

A Lima semi-enclosed, drip-proof, ball bearing motor of either 2 or 3 phase, 50/60 cycle, 220/440 or 550 volts is furnished as an integral part of the unit. Overall length is 18 in. including shaft extension, width 12 in. including shift lever and terminal box, heighth overall is 9 in., weight 85 lb.

Prox-Peel Forms Protective Coating on Tools and Parts

Prox-Peel plastic coating for the protection of bearings, tools and precision parts in storage or transit is a product of Pyroxylin Products of 4851 So. St. Louis Ave., Chicago 32. The material is supplied in slabs which are melted and are held at approximately 350 F. Parts are dipped in the molten Prox-Peel and a semi-solid film forms on the surface. When the parts are withdrawn, the film solidifies to form a protective plastic coating of an average thickness of 0.06 to 0.10 in. It can be applied by hand or machine dipping operations.

Prox-Peel coated parts



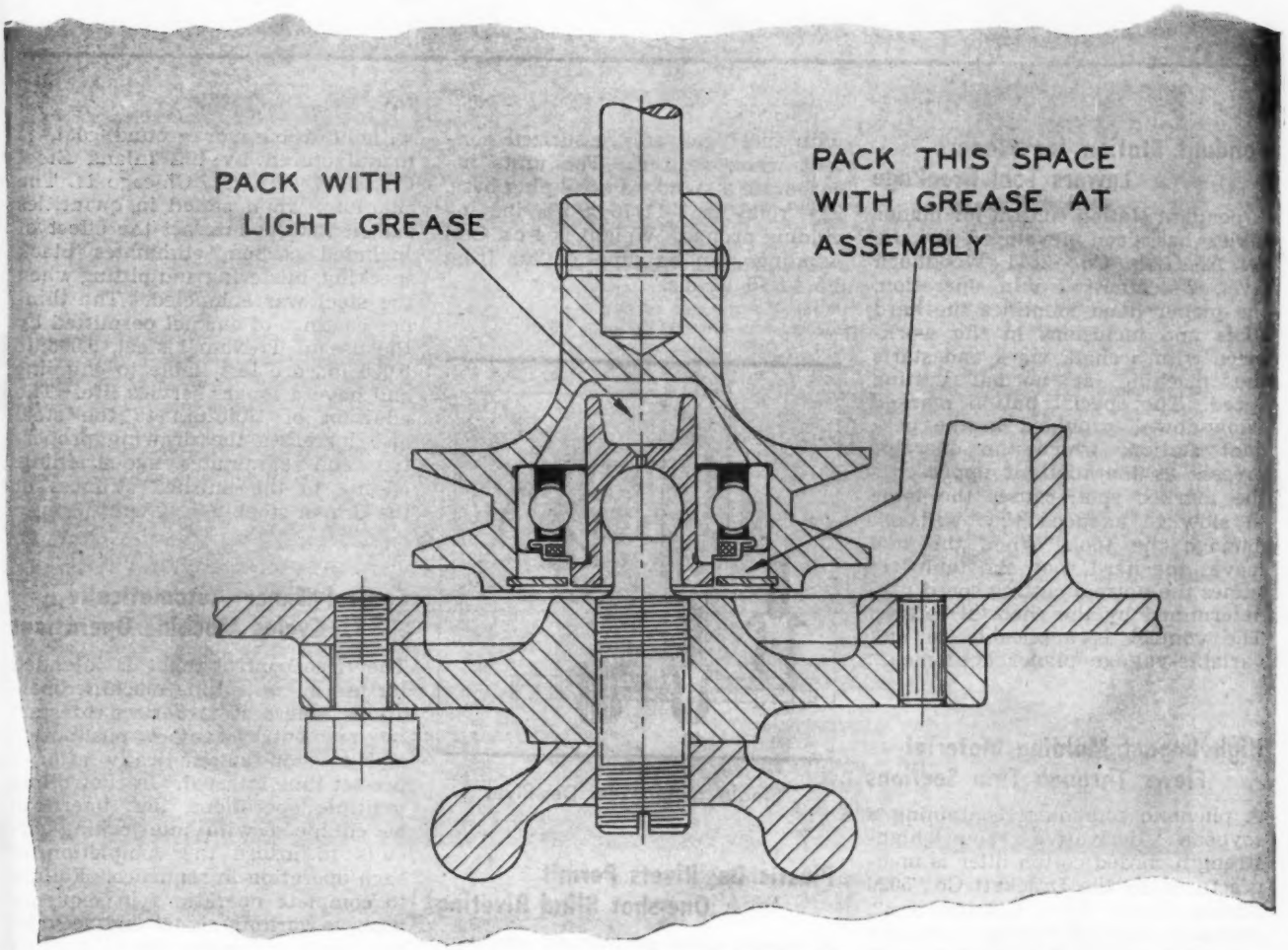
Aro hand drill

Aro High Torque Hand Drills With Speeds to 4,000 R.P.M.

Several models of air-operated hand drills with one-piece aluminum housings are manufactured by the Aro Equipment Corp., Bryant, Ohio. The drills can be equipped with 3/16, ¼, or 5/16 Jacobs chucks to operate at either 2,500 or 4,000 r.p.m. The models attaining 4,000 r.p.m. speeds are intended for aircraft work and such applications that require high speeds and sustained torque.

Features of the drills include built-in oilers; 4 bladed motors; hardened and ground cylinders; 4 ball bearing construction and precision ground gears and cages.

Busy Ball Bearing
. . . *doing three jobs at once*



MANY millions of New Departure ball bearings are now busy for the duration performing a great variety of services vital to the success and future of the country. Afterward will come the important jobs of peace, when bearings must continue to work at top speed that the demands of so many may be met. Then too, ball bearings will demonstrate their outstanding ability to do more than one job at a time and do all well. The help of New Departure engineers is always . . . yours for the asking.

NEW DEPARTURE
BALL BEARINGS 3357

THIS BEARING MOUNTING

is for the lower bearing of a centrifugal separator. The upper bearing (not shown) is carried in a flexible housing to enable the separator bowl to oscillate until it finds its own axis of rotation.

Because of this, the lower bearing is so mounted as to not only support the weight of the basket and radial load from the belt drive, but to oscillate as well.

This is accomplished by applying the bearing to a thimble having a spherical seat so located that the bearing can oscillate about its own center.

The single sealed bearing and cup feeding to the spherical seat are packed with grease for long service without attention.

Ask for the complete series of mounting ideas.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT
Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*

Parts and Materials

Pendant Station for Planers Lowers Tool Breakage

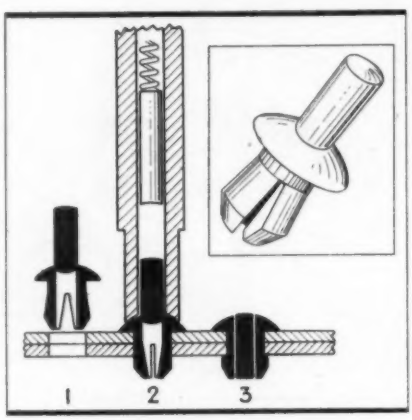
A pendant station control for planer tables has been developed by the G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7. In operation, the planer hand identifies the hard spots and inclusions in the workpiece with a chalk mark and starts the machine at normal cutting speed. The special button marked "slow-down" provided in the pendant station, which the operator presses as the tool bit approaches the marked spot, causes the table to slow to a speed that will not damage the tool. When the tool leaves the hard spot, the table resumes the normal cutting speed predetermined by the rheostat setting. The control is applicable to any variable-voltage planer equipment.

High Impact Molding Material Flows Through Thin Sections

A phenolic compound containing a soybean derivative and high-strength corded cotton filler is manufactured by the Drackett Co., 5020 Spring Grove Ave., Cincinnati 32. Standard R.S.T.M. tests show the material to have a tensile strength of 6,700/7,400 lb. per sq.in.; flexural strength of 10,000/14,000 lb. per sq.in.; compressive strength of 28,000/32,000 lb. per sq.in. and water absorption of 1.7 percent in 24 hours. The specific gravity is 1.41. The tendency of the resin to flow away from the filler has been reduced, permitting the material to flow into thin sections. The increased dimensional stability due to the excellent physical properties permits closer control of warpage and shrinkage.

B. & B. Midget Relays Sealed Hermetically for Protection

A midget type relay, announced by Betts & Betts Corp., 551 West 52 St., New York 18, N. Y., is hermetically sealed in a metal shell to withstand severe conditions of temperature, humidity, pressure, dust, corrosion and fungi. Units are normally sealed with content of pre-filtered dry air but can be furnished with inert gas or pressurized content when desired. The units incorporate a standard octal plug base. The relay is 1-11/16 x 2⅞ in., including prongs. Weight is 4 oz. Coil windings can be supplied for from 1.5 to 70 v., d.c.



Single action sets Des-Rivet

Plastic Des-Rivets Permit One-shot Blind Riveting

A plastic rivet permitting one-man operation and blind fastenings has been announced by the Plastic Development Division of the Victory Manufacturing Company of 1105 Fair Oaks Avenue, South Pasadena, Calif.

The design of the Des-Rivet is based on a wedging action and takes advantage of the flow characteristic of plastic materials under pressure. They are molded as one piece consisting of a head with plug attached by a thin break-away section and a tapered shank split to form four fingers.

The Des-Rivet is applied by pressing into a hole. Impact from a rivet gun, which may be manually or power operated, shears the plug and drives it into the shank, expanding the tail of the rivet.

Vitreous Enamel Applied to Ti-Namel Steel Without Base

A titanium-bearing steel, on which white or light pastels of vitreous enamels can be applied directly without a base or ground coat, is manufactured by the Inland Steel Co., 43 E. Ohio St., Chicago 11. The titanium, when added in quantities sufficient to counteract the effect of included carbon, eliminates black specking, blistering and pitting when the steel was enameled. The thinner coatings of enamel permitted by the use of Ti-Namel steel, 0.006 to 0.009 in., are less liable to chipping and have a longer service life. The addition of titanium to the steel also increases the drawing properties and eliminates age-straining, adding to the finished stiffness of the drawn steel.

Control Timer Automatically Cycles Machine Operations

The Reco control timer is intended for use in controlling machine operations where it is desired to start by momentary-contact pushbutton and to stop automatically after a pre-set time interval. In controlling multiple operations, the timer can be equipped with interlocking circuits to insure the completion of each operation in sequence. Failure to complete operations in sequence posts a warning signal and recycles the timer automatically to starting position. The timer is manufactured by the Reynolds Electric Co., 26 W. Congress St., Chicago 12. It is equipped with silver contacts and has a two circuit control. The synchronous drive motor operates on 110 volt a.c., 60 cycle current. If necessary, it can be equipped with additional circuits and arranged for other current specifications.

McGill Small Toggle Switch Is Dust- and Vibration-Proof

Dust- and vibration-proof construction feature a small, thin toggle switch developed especially for small tools, appliances and office machines by McGill Manufacturing Co., Valparaiso, Ind. Dimensions are 1 in. long, ½ in. wide and ½ in. thick. The switch is made in three types: No. 25, single pole, rated 6 amp. at 125 v., 3 amp. at 250 v.; No. 27, three way, rated 6 amp. at 125 v.; and No. 28 two-circuits, no "off" position, rated 6 amp. at 125 v.

PRECISION INSPECTION AND MANUFACTURING

The Sheffield Corporation has provided industry with a broad line of precision gages and instruments for the dimensional control of manufactured mechanical parts of all kinds. These include the Visual Gage, Precisionaire, Multichek, Electrigage, Electrichek, Internal and External Measuring Instrument, Thread Checking Instruments and Automatic Gaging Machines. Only a few of these are illustrated here.

FOR THE MANUFACTURE OF PRECISION THREADS AND FORMS

The Micro-Form Grinder provides the most economical method of grinding both flat and circular form tools from carbides and steels. Precision forms and threads are most accurately produced in a shorter time, often by plunge grinding, on the Precision Thread and Form Grinder with a crusher dressed multi-ribbed wheel. These machines can also be used in making crusher rolls for dressing surface grinder wheels.

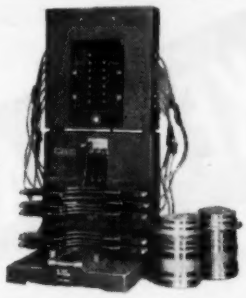
SHEFFIELD CONTRACT SERVICES

As one of a very few American manufacturers producing both machine tools and precision inspection equipment, Sheffield is excellently prepared to coordinate both quantity and quality production. In this connection, Sheffield serves many manufacturers on tooling programs and maintains a large staff of expert tool engineers. Sheffield offers the combined services of both the tool engineering department and the manufacturing department or either individually.

Contract production for other manufacturers include also precision threaded parts, form tools of all kinds, sub-assemblies and complete assemblies.

WRITE FOR ENGINEERING DATA

VISUAL GAGE, available in six amplifications, for checking external dimensions both in process and final inspection. Angularity of surfaces, angularity between a surface and a bore, surface run-out, pitch diameter of screw threads, internal dimensions, and other critical conditions can be checked with the use of standard and special accessories.

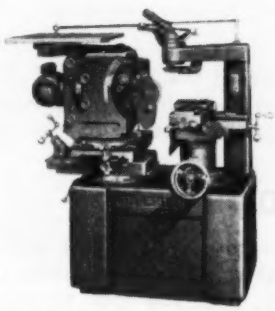


SHEFFIELD MULTICHEKS inspect from 2 to 20 and more dimensions (both upper and lower limit) simultaneously in one operation. Savings in time, floor space, inspection and production costs normally offset the cost of a Multichek in from 6 to 12 weeks.

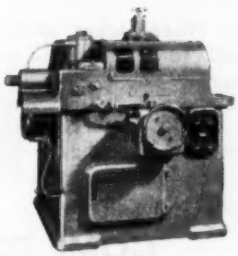
THE PRECISIONAIRE is a flow-type air gage for measuring internal and external dimensions, bell mouth, out-of-round and average diameters of through, blind and step holes. It checks both GO and NOT GO limits in one pass very much faster and with 10 to 40 times less gage wear than can be done with fixed size gages. The human element of error does not enter.

THE SHEFFIELD INTERNAL - EXTERNAL MEASURING INSTRUMENT with Electrigage.

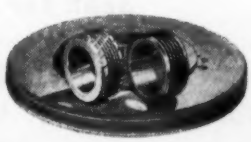
TYPE C AIRSNAP for checking external dimensions.



This is the SHEFFIELD PRECISION THREAD AND FORM GRINDER using the amazing crusher roll method of dressing a multi-ribbed wheel for the production of threads or forms by either plunge or traverse grinding. Can also be used as a conventional single point grinder.



THE SHEFFIELD MICRO-FORM GRINDER grinds any flat or circular form tool, profile work or wheel crusher rolls to an accuracy of .0003" directly from a 50 to 1 layout drawing—no template required. It saves up to 75% in machine time over conventional methods, especially on carbides.



Multi-ribbed wheel, crusher roll and work part.

THE SHEFFIELD CORPORATION

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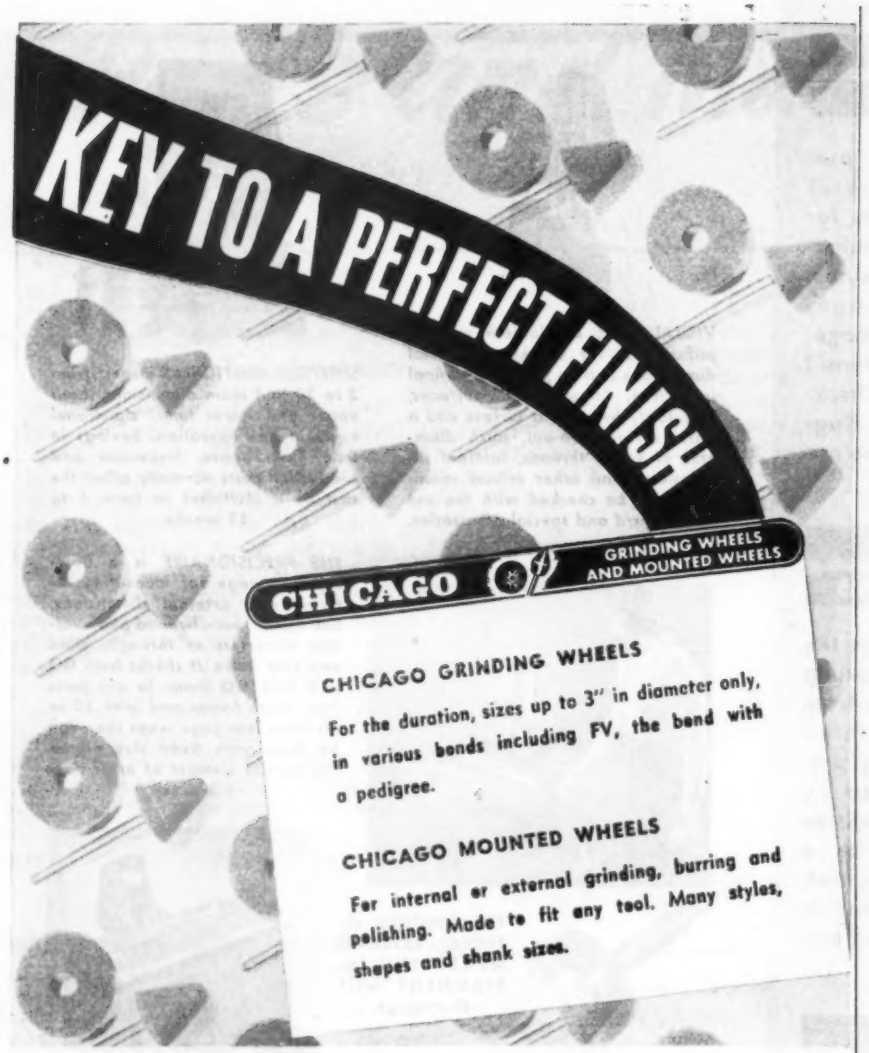
KEY TO A PERFECT FINISH
CHICAGO
GRINDING WHEELS AND MOUNTED WHEELS
CHICAGO GRINDING WHEELS
For the duration, sizes up to 3" in diameter only, in various bonds including FV, the bond with a pedigree.
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There's half a century of experience behind this, fifty years of specializing on grinding wheels—grinding wheels with hundreds of varieties in shape, size, abrasive and bond formulas, engineered for the right tool speed and work pressure.

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Our long experience and testing laboratory are at your service, free for the asking. Tell us about your tough grinding or polishing job. Our abrasive engineers will report promptly, give you their tested solution.

TRY ONE FREE – A Chicago Mounted Wheel or an FV Bond Grinding Wheel sent promptly on request. Tell us size preferred and what you have to grind.

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Send catalog, interested in
☐ Mounted Wheels
☐ Grinding Wheels
☐ Send test wheel

Name .....
Size ..... Address .....

TRADE PUBLICATIONS

Conveyors—Bulletin No. 462 containing specifications of Rex apron and pan feeders and conveyors, with capacity tables. Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

Conveyors—Illustrated folder with detailed information on gravity and power conveyors and dispatching systems. Standard Conveyor Co., North St. Paul, Minn.

Drills—Hercules twist and watchmakers' drills are listed in a circular containing details of both types from 0.150 to 1 in. diameter. Whitman & Barnes, Detroit 16, Mich.

Electrical Fittings—A 32-page catalog illustrates and describes multicontact plugs and sockets, terminal strips and fuse mountings. Howard B. Jones Co., 2460 W. George St., Chicago 18, Ill.

Gear Cutting—Illustrated booklet of Red Wing gear-cutting and finishing tools. National Broach and Machine Co., 5600 St. Jean, Detroit, Mich.

Grinding—A grinding-wheel data book of 120 pages containing detailed specifications and information. Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pa.

Heat-Treatment—A booklet of 26 pages on the heat-treatment of steel and products of the Houghton line. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Layout Paint—Pamphlet describing the Transfax process for reproducing working drawings on flat surfaces. Eastman Kodak Co., Rochester 4, N. Y.

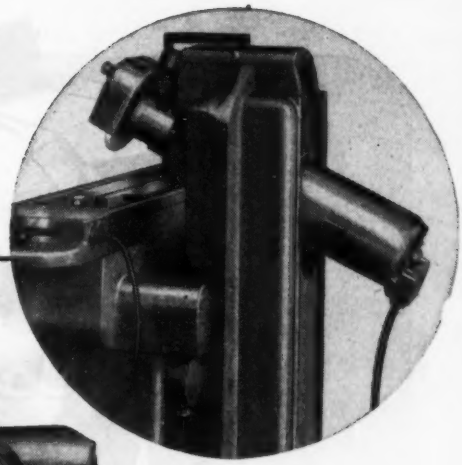
Machine Tools—Illustrated folder with pointers on broaching, grinding and indexing machines and methods. Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

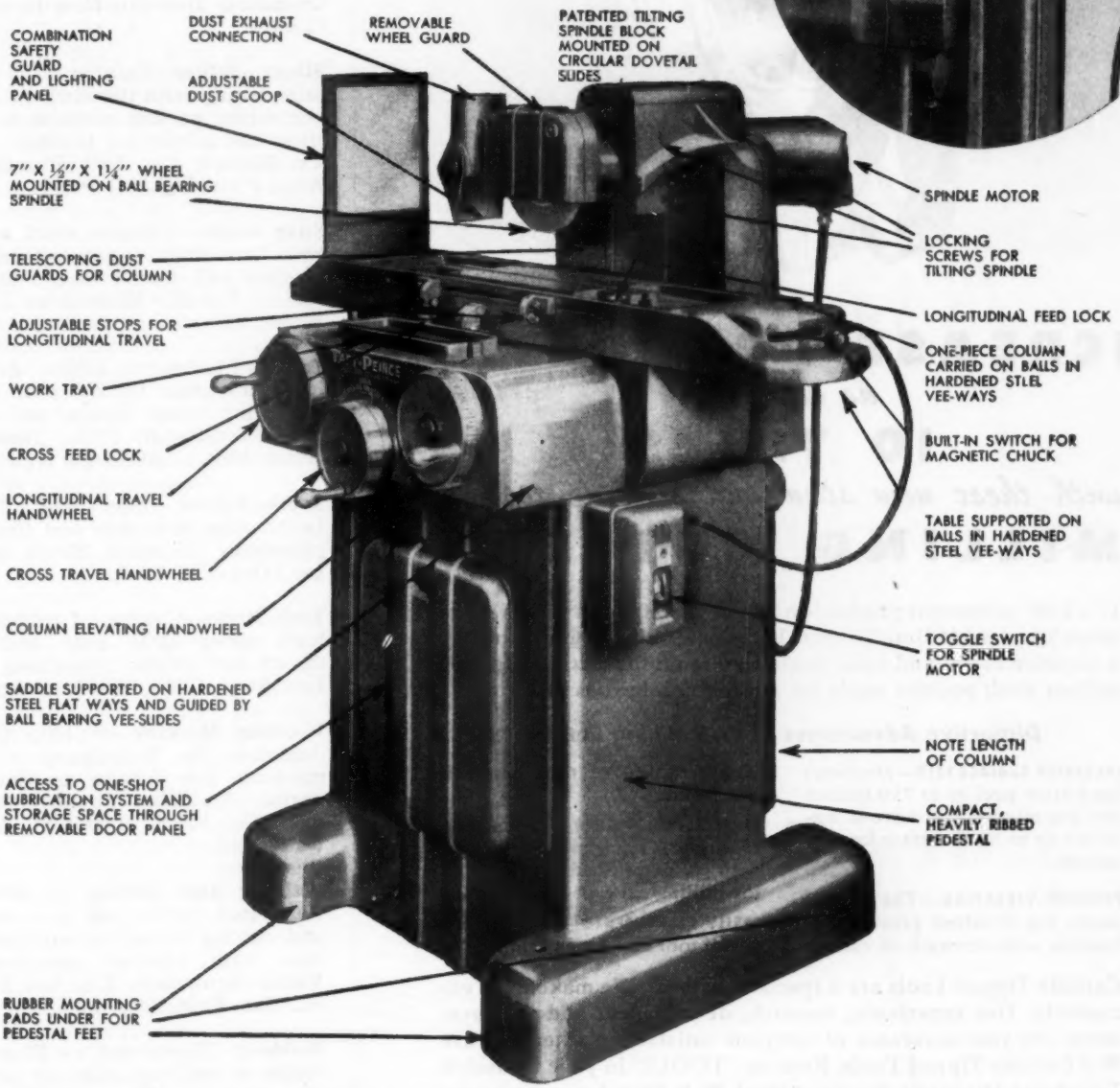
Metal Spraying—Bound volume of issues of "Metco News," August, 1940 to October, 1944, covering developments and applications of the metal spraying process. Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City 1, N. Y.

Oil Strainers—Folder on Metex oil strainers for use on machine tools. George Butler Co., 1015 W. Washington Blvd., Chicago 7, Ill.

Punches and Dies—A catalog of punches and dies available in sizes from ⅛ in. to 3⅛ in., in increments of 1/64 in. Wiedemann Machine

From Tilting Wheelhead to Rubber-Shod Feet



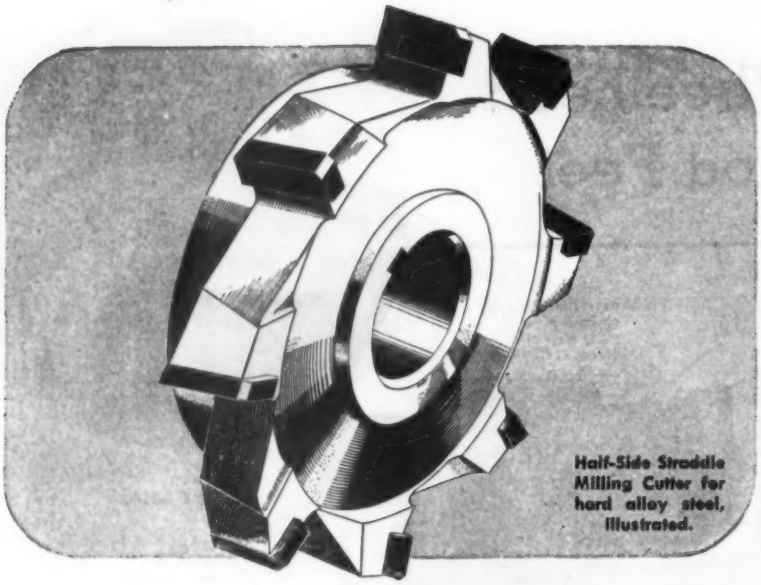

COMBINATION SAFETY GUARD AND LIGHTING PANEL
DUST EXHAUST CONNECTION
ADJUSTABLE DUST SCOOP
REMOVABLE WHEEL GUARD
PATENTED TILTING SPINDLE BLOCK MOUNTED ON CIRCULAR DOVETAIL SLIDES
7" X ⅜" X 1¼" WHEEL MOUNTED ON BALL BEARING SPINDLE
TELESCOPING DUST GUARDS FOR COLUMN
ADJUSTABLE STOPS FOR LONGITUDINAL TRAVEL
WORK TRAY
CROSS FEED LOCK
LONGITUDINAL TRAVEL HANDWHEEL
CROSS TRAVEL HANDWHEEL
COLUMN ELEVATING HANDWHEEL
SADDLE SUPPORTED ON HARDENED STEEL FLAT WAYS AND GUIDED BY BALL BEARING VEE-SLIDES
ACCESS TO ONE-SHOT LUBRICATION SYSTEM AND STORAGE SPACE THROUGH REMOVABLE DOOR PANEL
RUBBER MOUNTING PADS UNDER FOUR PEDESTAL FEET
SPINDLE MOTOR
LOCKING SCREWS FOR TILTING SPINDLE
LONGITUDINAL FEED LOCK
ONE-PIECE COLUMN CARRIED ON BALLS IN HARDENED STEEL VEE-WAYS
BUILT-IN SWITCH FOR MAGNETIC CHUCK
TABLE SUPPORTED ON BALLS IN HARDENED STEEL VEE-WAYS
TOGGLE SWITCH FOR SPINDLE MOTOR
NOTE LENGTH OF COLUMN
COMPACT, HEAVILY RIBBED PEDESTAL

...the Taft-Peirce No. 1 Surface Grinder is a ***RUGGED INDIVIDUALIST*** *bringing New Precision to Small Work*

The distinct individuality of the Taft-Pierce No. 1 Precision Surface Grinder is the sum of many original features. *Look at them.* Note the exclusive tilting wheelhead which adapts the machine to difficult angle and shoulder work. Note, too, its effortless operation and the assurance of long life inherent in its hardened and ground ways and the ball-bearing travel of table, saddle, and column. And the proportions of this outstanding grinder are far heavier than usual in machines of this capacity . . . another reason why this is the most accurate grinder of its size on the market.

If you are interested in grinding small parts, gages, and tools to the highest possible degree of accuracy, flatness, and finish, write for Bulletin No. 1.

THE TAFT-PEIRCE MFG. CO., WOONSOCKET, R. I.



Half-Side Straddle Milling Cutter for hard alloy steel, illustrated.

INCREASE PRODUCTION

as many as

10 TIMES

with these new standard carbide tipped

MILLING CUTTERS

IT'S EASY to increase production as many as 10 times with Wendt-Sonis Standard Milling Cutters. These new milling cutters employ a negative radial and helix angle feature on the cutting edge for milling steel; positive angle for milling non-ferrous materials.

Distinctive Advantages of W-S Milling Cutters

INCREASED SURFACE FEED—Machines hard alloy steel up to 750 surface feet per minute; non-ferrous materials up to 3400 surface feet per minute.

PREVENTS VIBRATION—The built-in heavy lug fly-wheel prevents vibration, adds strength to cutters; lengthens life of tool between sharpenings.

ESPECIALLY DESIGNED—for carbide cutting—not just a HSS design with carbide tips. Recommended for milling all types of material.

EASILY RESHARPENED—on any universal tool and cutter grinder.

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools. Refer to "TOOLS" in your Classified Telephone Directory, for your local W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.

Free!

Now! CATALOG 144. Contains data and latest prices on W-S Standard Milling Cutters plus many other standardized carbide-tipped tools formerly classed as "special." WRITE TODAY for FREE copy.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

Co., 189 Sedgley Ave., Philadelphia 32, Pa.

Scales—Kron springless dial scales described in a 78-page booklet, with capacities and other details. The Yale & Towne Mfg. Co., Philadelphia 24, Pa.

Screw Threads—Booklet "Threads," covering tools and machines for the production of screw threads. The Geometric Tool Co., New Haven 15, Conn.

Silver Solder—Catalog C-11 contains listings and illustrations of silver solder backed contacts in Gibsiloy and silver for brazing. Gibson Electric Co., 8350 Frankstown Ave., Pittsburgh 21, Pa.

Snap Gages—Tubular steel adjustable limit snap gages, with details of sizes and ranges in a four-page folder. Tubular Micrometer Co., St. James, Minn.

Tanks—Illustrated folder describing glass tanks for hot acids, electroplating, dyes, foods and other uses. Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

Tools—Folder describing "Snap-Lock" plier wrenches and their applications. Seymour Smith & Son Inc., Oakville, Conn.

Tool Steels—Catalog of carbon and high speed drill rods and cold drawn tool steels. Allegheny Ludlum Steel Corp., Brackenridge, Pa.

Washing Machine—Bulletin No. 19 describes the Tabl-Spray washing machine for fragile or intricate parts. American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind.

Welding and Cutting—A 104-page illustrated catalog of gas welding and cutting equipment and accessories, with detailed specifications. Victor Equipment Co., 844 Folsom St., San Francisco, Calif.

Welding Equipment — Illustrated folder of welding units for production purposes. Thomson-Gibb Electric Welding Co., Lynn, Mass.

TO THE EDITOR

A Letter to WPB

Dear Editor:

Following is a copy of a letter forwarded to the WPB:

War Production Board
Washington, D. C.

Chief, may I as an old tool designer and die engineer of over 35

years in this field alone, call your attention to these facts: Since the war I have shifted to 13 different plants to learn the trouble, if trouble it were, that so many rejections of tools by the government on the point of not to scale or dimensions undersize, etc. These plants have sent me in to hundreds of sub-jobbers to figure tools. There is a cause for at least 60 to 70 percent which could be remedied in most cases by the management or control of said management.

I was 16 years a tool- and diemaker before I became a tool engineer and have 35 years experience both technical and practical. The greatest mistake these firms have done is to try to work toolmakers and machinists together. It cannot be done and never will be done with success, and here is why. Machinists use tools heavier and different than toolmakers and as a rule soon get them out of shape. A toolmaker cannot use them. If a company only can afford one toolmaker, he should have a place by himself and no one to use his tools or machines. His tools must be first class. Then and then only will I show you tools, gages, jigs, and fixtures turned out 99 to 100 percent dead true.

I have in the last month met and talked to over 200 toolmakers—first rate men. They tell me it is just simply impossible for them to turn out a respectable job because machinists had the machines and tools all out of shape by using them on rough work or misuse, or they spent hours to find and rig up for a jig or fixture and then found the machine so far out of alignment by some rough machinist or the Johannson blocks or height gages or some other thing so far off it took hours of repair and then with no surety that it would hold up to the government's standards, until they were sick at heart.

They would leave this place to go to another only to find the same conditions, unless they were fortunate to find a shop that only produced tools alone. Then usually the management had bought second hand machines hardly fit for machinist or had been formerly used by machinists and thoroughly out of shape, and the management made a further error by refusing to allow time for repairing of said machines, if they could be repaired and were not too far gone. So here again they were at least 75 percent handicapped, and the shop stewards, in most cases never having toolmaker's experience, sanction this thinking it is O.K.

In New York City alone since this war I would be safe in saying over $7,000,000 in fine tools have been lost and equally as many man-hours by this unscientific and senseless idea of trying to work toolmakers and machinist together using the same tools and equipment. It is not too late to remedy this condition,

ADD PRESSURE SEAL

to quicker fit...

THIS MAY BE NEWS to you ... You can get all the advantages of Laminum *plus* the sealing of oil and pressure in bearings ... in *babbitted* Laminum shims. The babbitt lugs are securely locked into the Laminum. Details on request.

Laminum shims are cut to your specifications. For maintenance work, however, shim materials are sold through industrial distributors.

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LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

Let Us Help You
Get More Real Output from Your Hack Saws
TECHNITE
The Capewell Field Engineer has shown many concerns how to get more efficient operation from their hack saw machines — more production — lower costs. Your mill supply house will be glad to send a Capewell man to check your operations.
CAPEWELL
HACK SAW BLADES
CAPEWELL 1881 U.S.A.
The Capewell Mfg. Co.
Hartford, 2, Conn.
The trend is to TECHNITE, the molybdenum high speed hack saw blade

and should be done at once by all means.

The last place I saw, six first rate toolmakers had the poorest equipment and downstairs the rough machinists had the best equipment and yet they are allowed by the management to come up and get or use the toolmakers machines or tools at will; as a result the last five government jobs went out of this shop two barely passed, the other three were out. This was no fault of the toolmakers but with the unreasoning sense of the management. Now, correct this condition as above suggested, and the rejected tools, jigs, and gages will be at nil; however let this continue and conditions will get worse and more scrap with precision tools will result.

Very respectively,
An Experienced Toolmaker

NEW BOOKS

HIGH FREQUENCY INDUCTION HEATING —*By Frank W. Curtis, Consulting Engineer, Induction Heating Corporation. 135 pages. Published by the McGraw-Hill Book Co., 330 W. 42 St., New York 18, N. Y. $2.75.*

Induction heating is a "hot" subject today. Possibilities of heating and quenching workpieces in a short accurately controlled cycle has intrigued the imagination of production engineers and aroused the interest of equipment manufacturers. The process is not limited to hardening, but can be used for brazing, soldering, annealing, or in fact most any industrial process requiring the application of heat. Another form of high-frequency heating, known as dielectric heating, may be applied to materials normally nonconductive has possibilities of wide application in the field of plastics.

Mr. Curtis' book is one of the first to be offered to industry on the subject. It is a highly practical presentation, in that it tells just what induction heating can and cannot do and offers specific suggestions for applying it.

The author describes the various methods of obtaining the high frequencies used in the process and links the range of frequency with the results produced in various types of workpieces. He goes into the design of induction heating coils, showing how their construction may be varied to accommodate different kinds of surfaces.

The induction cycle with its controls is described in the light of manufacturing requirements. In addition the book contains an excellent chapter on the design of fixtures for induction heating, giving many practical pointers on set-ups that have been found useful on specific jobs.

Designing for induction heating is also described, as best results can be obtained from the process only if parts are designed with the high frequency process in view.

Until this volume appeared the scope and possibilities of high frequency induction heating had not received the attention they deserve.

SEEN and HEARD

By JOHN R. GODFREY

Attention to Detail

MOST SHOPS go along buying their supplies according to habit or tradition without making periodic checks as to whether the kind and quality is the best for the use to which it is put. Take a common commodity such as sandpaper, for instance. There are five or six degrees of rigidity or flexibility in cloth backing; perhaps paper can be substituted for cloth (or the direct opposite) with true economy. A little investigation might show how to obtain an improved finish; how to do certain small, difficult jobs with some of the new shapes in which coated abrasives are now made.

A talk with a representative of firms supplying such products will usually cause a shop manager to say that he "never knew there were so many kinds and shapes." He will no doubt learn of some of the latest machines for doing old jobs in a better way. He may also learn whether this sandpaper is stored under suitable conditions and whether there is a more economical form in which to buy it.

"Down" Feed in 1872

FRED H. COLVIN

YEARS AGO my old friend Oberlin Smith, of Ferracute, amused us all by his remark that "a visit to the British Museum surprised him by revealing how many times the ancients had *stolen* his inventions." We have all had similar experiences. My most recent surprise came from rereading an article by Amos Brainard, in the July, 1895, issue of *Machinery*, while I was its editor.

I remembered the article which was secured personally, as I knew Amos Brainard very well. But I had completely forgotten his startling statement to the effect that he had made—and I think patented in 1872—a compensating nut for his feed screws so he could "feed with the cut."

Was this the beginning of "climb" or "down" cutting?

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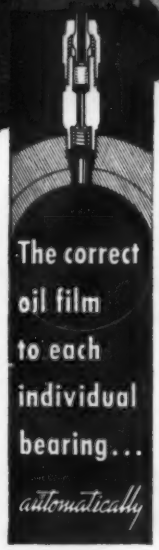
throughout . .

"MONARCH" Lathe
. . . Bijur-Equipped.



■ LUBRICATION CONTROL is of utmost importance in maintaining maximum output. Control must be positive—at all times. With a Bijur lubricator on the job, manpower is concentrated on actual production. The machine practically takes care of itself over long periods of operation.

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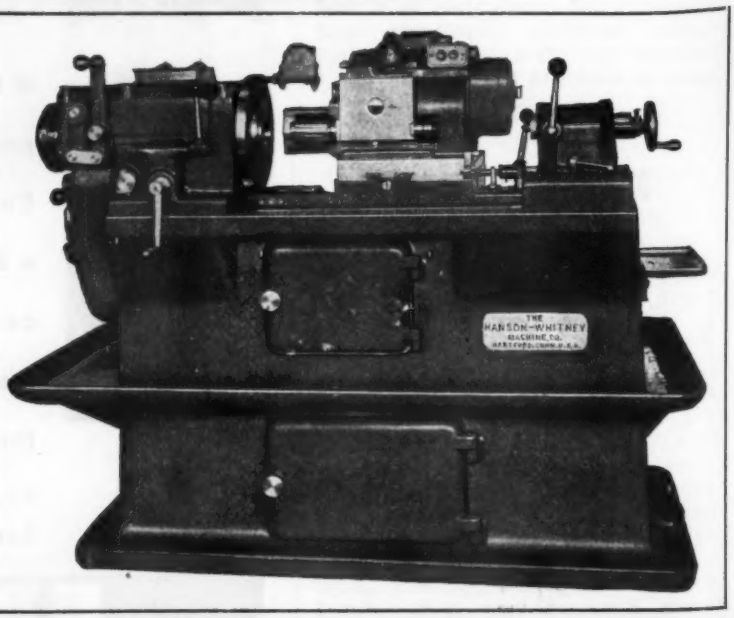
Go Ahead Signal

H-W Semi-Automatic Thread Milling Machines employ multiple cutters that finish threads in one revolution . . . producing internal, external or taper threads . . . right or left hand . . . with equal speed, facility and precision. We'd like to tell you about them. Give us the "go ahead signal" with a letter or wire.



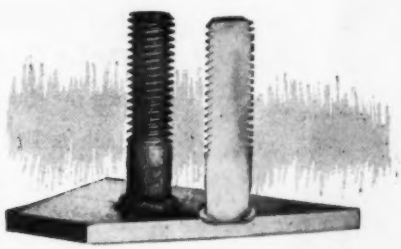
THE HANSON WHITNEY MACHINE CO.

HARTFORD CONNECTICUT U.S.A.

End-weld studs in ½ second—automatically!

- ★ **Complete fusion results between stud and metal.**
- ★ **No drilling holes, or hand-welding bolts—saves time and material. Studs accurately located.**
- ★ **One operator can weld more than 1000 studs a shift. No previous welding experience is necessary.**
- ★ **Thousands of guns are now in use in more than 500 shipyards and industrial plants.**

The Nelson Stud Welder is simple to use. All welding is automatically controlled. The tool is completely portable, or may be operated from a fixed jig.



Cutaway view of a stud weld (after etching with Nital) shows the complete fusion of the stud to metal . . . the result of complete shielding of the arc, accurate arc timing, and the use of "flux-filled" studs.

For complete details, prices and catalog, write:

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Dept. B, 440 Peralta Ave., San Leandro, Calif.

Eastern Representative: Camden Stud Welding Corp. Dept. 22, 1416 South Sixth Street, Camden, N. J.

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Black & Decker
. . . Designed for

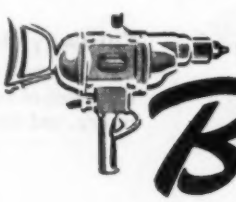
The same efficient portable tool makes a powerful drill press, too!

That's right! The same Black & Decker Electric Drill that's so handy to carry from job to job also clamps quickly into a Black & Decker Drill Stand to make a powerful drill press and is just as quickly removed for portable use. And Black & Decker Drills of all sizes—from ¼" to 1¼"—are designed and powered for this double-duty service.

Black & Decker Drill Stands provide the leverage for a steady, smooth feed on precision work . . . as well as for tremendous pressure when needed. And Black & Decker Drills have what it takes to keep going under that pressure, on any job up to their rated capacity.

That's because each part in every Black & Decker Tool is specifically designed and made for the job it has to do. For example, Black & Decker uses no *stock* motors. The motor in any Black & Decker Tool is engineered and built completely *by Black & Decker*—to deliver maximum efficiency and performance in that particular tool.

Whether you buy one tool or thousands, get the extra satisfaction that's built into every product of Black & Decker—world's largest manufacturer of portable electric tools. And for the answer to most any tooling problem, call your nearby Black & Decker Distributor. You'll find him anxious to be of service and a ready source of information and supply on the complete Black & Decker line. The Black & Decker Mfg. Co., 616 Penna. Ave., Towson 4, Md.



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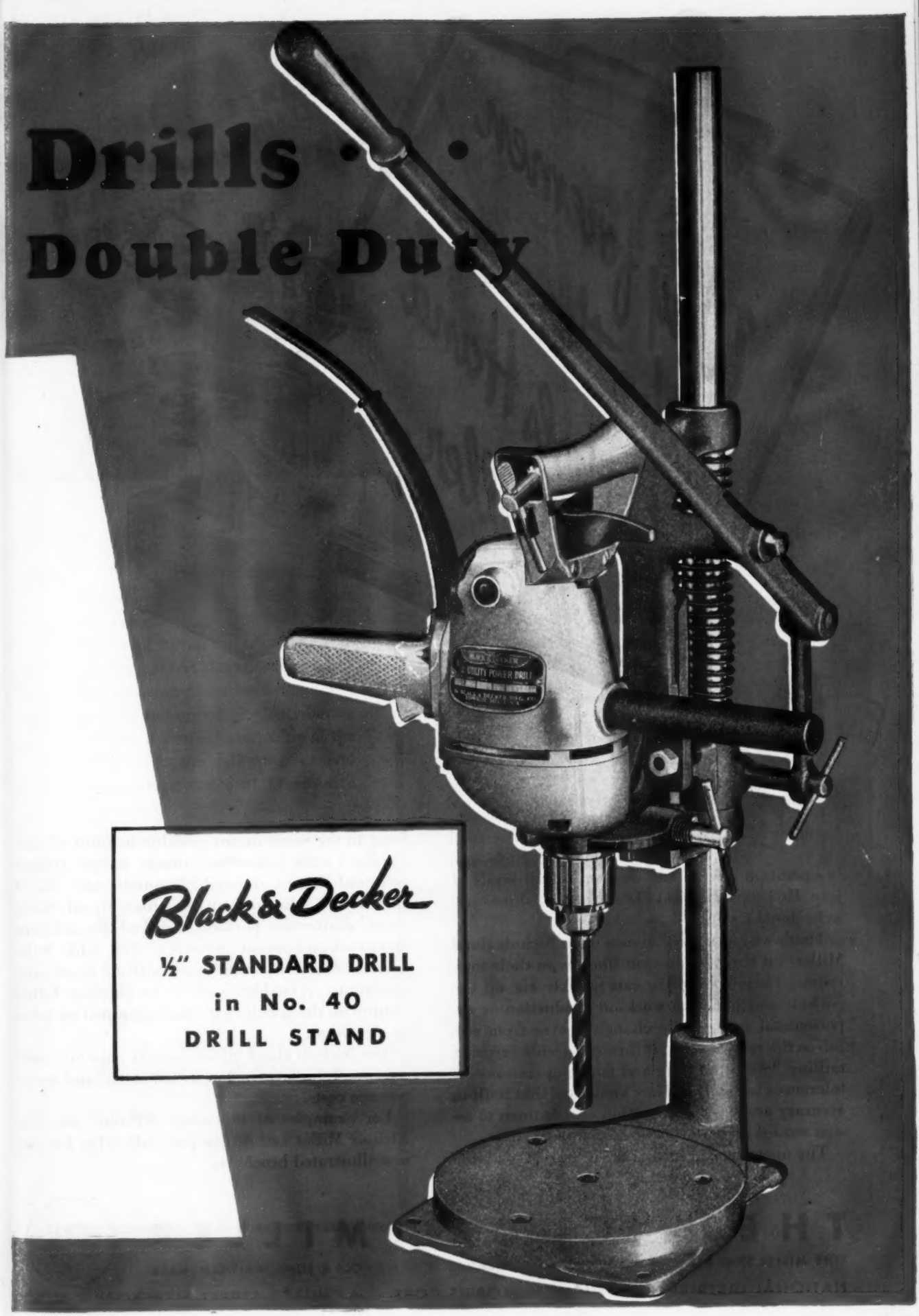
PORTABLE ELECTRIC **TOOLS**


Drills • • •
Double Duty
Black & Decker
½" STANDARD DRILL
in No. 40
DRILL STAND

A foreman gets a pretty good line on a machine watching it in operation day in and day out on all kinds of jobs. He keeps a mental file of "key" machines just as he does of workers.

That's why so many foremen want Nichols Hand Millers on their production lines or in their tool-rooms. They know they can quickly rig up the Nichols and put it to work on production or experimental runs, easily change it over from one job to the next and put it through a wide range of milling, boring, turning and facing operations—to tolerances in "tenths." They know, too, that built-in accuracy and ease of operation enable them to assign semi-skilled workers on Nichols Millers.

The operator can bring the cutter on its sliding head to the work in any position in front of him (or her) with little effort, thanks to the Nichols counter-balanced rise-and-fall spindle unit. Rigid spindle and solid construction eliminate all shake, assure chatter-free performance. And the exclusive lever-rack-and-pinion transverse feed adds lathe carriage flexibility to the most intricate machining operations . . . enables work to be chucked lathe-fashion on the spindle with tools mounted on table or vice versa.

The Nichols Hand Miller quickly pays for itself. And you'll be surprised at its low initial and maintenance costs.

For examples of the many different jobs the Nichols Miller can do for you, ask today for our new illustrated brochure.

THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASS.

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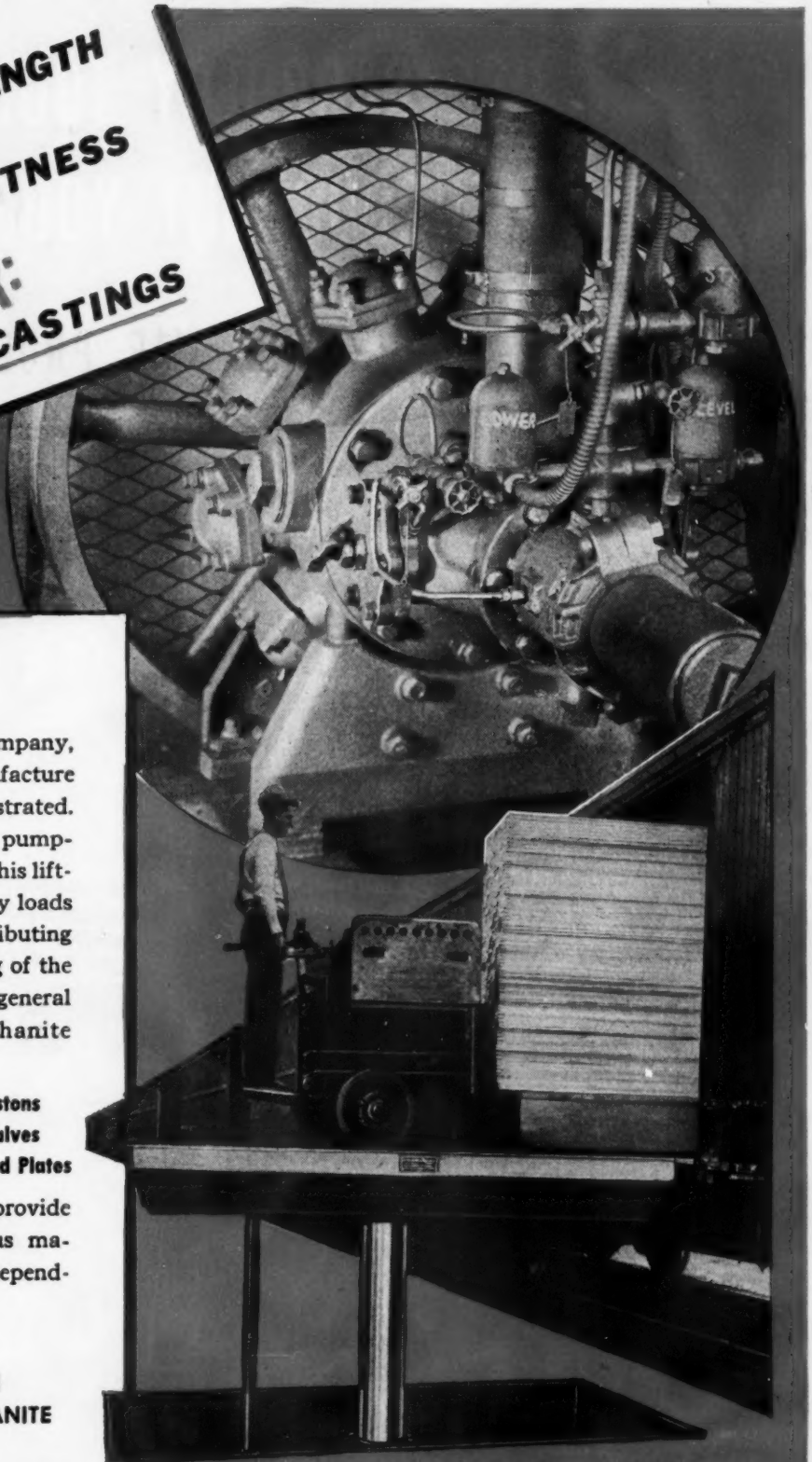
THE NEED: STRENGTH DEPENDABILITY PRESSURE TIGHTNESS

THE ANSWER: MEEHANITE CASTINGS



The Rotary Lift Company, Memphis, Tennessee, manufacture the Freight "LEVELATOR" illustrated. Operated by an electric oil pumping mechanism also shown, this lifting equipment handles heavy loads rapidly and smoothly. Contributing to the successful functioning of the design are the following general engineering types of Meehanite Castings:

Pump Crankshafts	**Pistons**
Cylinder Heads and Blocks	**Valves**
Bearing Retainers	**End Plates**

These Meehanite Castings provide the required properties plus machinability, uniformity and dependability.

Additional proof that

IN PRODUCT DESIGN THE TREND IS TO MEEHANITE

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WRITE FOR the Meehanite Handbook—55 pages of data important to all users of castings.

MEEHANITE RESEARCH INSTITUTE

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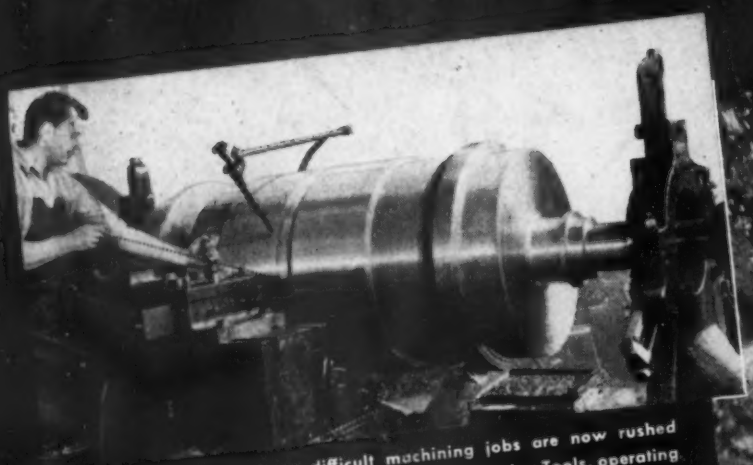
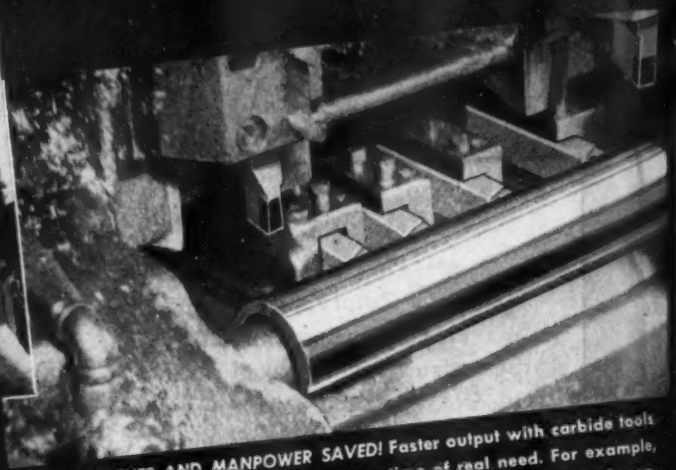
USE CARBOLOY TOOLS THROUGHOUT YOUR PLANT

ON VITAL WAR PRODUCTION

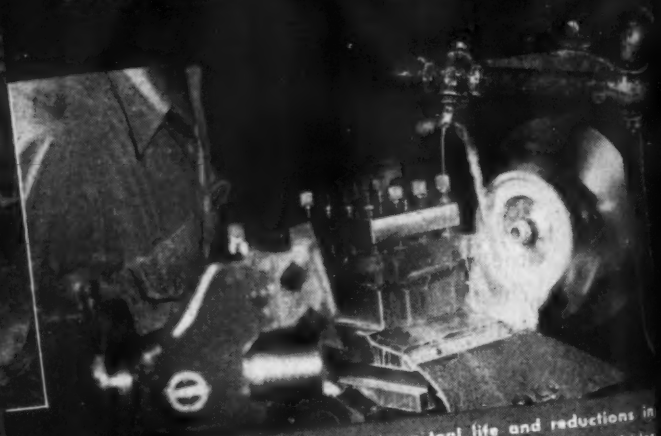


VITAL TIME SAVED! Long difficult machining jobs are now rushed through amazingly fast on this 12-ton rotor. Carboloy Tools, operating at speeds up to 342 F.P.M., feeds up to .047", cuts as deep as 3/4", saved 8 days removing 6 tons of steel.



MACHINES AND MANPOWER SAVED! Faster output with carbide tools has resulted in vital economies in a time of real need. For example, shells for World War II are machined with 1/4th the number of man-hours per 1000 shells—as in World War I.

HIGH QUALITY RESULTS—FASTER! Unusual ability of carbides to produce fine finish, close tolerance, produces high quality results—fast! On this job, hand polishing time reduced 80%.



UNPRECEDENTED TOOL ECONOMY! Long tool life and reductions in passes required, combine to give unusual tool economy with carbides—even on older equipment. Standard Carboloy Tools above eliminated 4 stations on turret—saved 19 tools.

FOR CUTTING STEEL • CAST IRON • NONFERROUS METALS

STANDARD CARBOLOY • TURNING • FACING • BORING TOOLS
BLANKS
FOR GENERAL USE
POINTED NOSE
FOR SCRAPERS
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FOR TWIST DRILLS
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HOIST-POWER helps manpower to be more productive

Capacities from ¼th to 1 ton. Available for plug-in on 110, 220 or 440 volt circuits. One-hand control. Prices from $130.

Materials handling is said to represent the largest single labor cost in industry—the largest single use of manpower. CM Comet Electric Hoists can make this same man (and woman) power more productive, more efficient and with less fatigue. From "receiving", through the production line, to "shipping", CM Comets are doing an outstanding job in making both ends meet. Write today for CM Bulletin 138 for the entire illustrated details.

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How to get the most out of AIR COMPRESSORS

shown in this complete, practical guide to efficient and economical

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Installation
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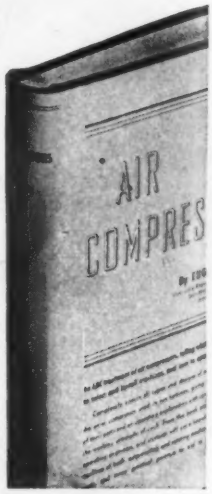

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AIR COMPRESSORS

By EUGENE W. F. FELLER

Operating Engineer, formerly Assistant Chief Operator, Safe Harbor Water Power Corp., Associate Editor, *Power*

460 pages, 5⅛ x 8¼, 414 illustrations, $4.50

Here's a brief idea of what this helpful book gives you:

—information on the kinds of compressors available, with the pointers on performance, service limitations, etc., needed in selection

—complete mechanical description of every part of reciprocating, two impeller, sliding vane, liquid piston, centrifugal, and axial compressors

—full explanation of load-control devices, compressor lubrication requirements, and other special topics

—instructions and diagrams on location, foundation, erection, alignment, adjustment, and other details of compressor installation

—directions for operating all types of compressors, with special attention on trouble points to watch

—maintenance helps, covering everything from minor adjustments to the making and fitting of piston rings

Procedure for lining up rotating shafts—convenient separate chapter of air compressing theory—material on hydraulic air compressing—comparative costs and pointers on compressor selection—these are other helpful features of this exceptionally thorough and practical manual.

Includes a complete description of the

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of which the axial compressor is a necessary accessory, giving you an up-to-the-minute view of the features of this formidable newcomer in the field of power generation.

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Modern materials give designers great freedom of choice. Stainless Steels by Rustless closely approach the designing engineer's ideal. They offer combinations of properties, high strength-weight ratio, a wide variety of physical characteristics, ease of fabrication and great permanence in service.

A few of the advantages of using Stainless Steels are...

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Stainless Steels have remarkable resistance to a wide variety of corrosion conditions and to the effects of high temperature exposure; no plating to peel or wear off; no paint to chip; possess great dimensional stability and resistance to abrasion and erosion.

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Over a wide temperature range Stainless Steels, depending upon grade and size, offer: tensile strengths ranging from 70,000 to 300,000 pounds per square inch; high yield strengths; high strength-weight ratios, thus permitting lighter, safer, and more dependable structures.

STIFFNESS

With high elastic moduli, Stainless Steels have nearly twice the rigidity of copper base alloys—three times that of aluminum—five times that of magnesium—and many times that of plastics. This is important when designing for minimum space.

TOUGHNESS

Stainless Steels will absorb great shock loads even at extremely low temperatures and have exceptional endurance strength; yet they can be machined, formed and welded with ease.

ECONOMY

In spite of somewhat higher initial cost compared to ordinary steel, Stainless Steel products have long life at low maintenance which results in best overall economy. Fabrication costs which often constitute the bulk of total costs can be reduced by the application of proper techniques.

SALES APPEAL

The clean, bright surface of Stainless Steels has captivated public acceptance for appearance, sanitation and utility. Consumer articles marked "Stainless" sell quickly

HOW TO SELECT THE PROPER STAINLESS GRADE

There are many grades of Stainless Steels. Each has its own composition, physical characteristics, mechanical properties and degree of corrosion resistance and workability.

Because the characteristics of Stainless Steels differ from one another and from other materials, you will want to consult Rustless—America's only exclusive producer of Stainless Steels—for data and experience necessary for proper design and selection.

All Stainless Steels contain as a basic ingredient ten percent or more chromium. It is this element which produces the corrosion and scale resisting properties. Such elements as nickel, molybdenum, columbium, titanium and several others contribute special attributes.

THERE ARE THREE BASIC GROUPS OF STAINLESS STEELS

Straight Chromium—Hardenable by Heat Treatment

Rustless 12	Type 410
Rustless 12T	Type 403
Rustless 12FM	Type 416
Rustless 13-C-35	Type 420
Rustless 13-C-35FM	Type 420F
Rustless 16-2	Type 431
Rustless 17-C-60	Type 440A
Rustless 17-C-80	Type 440B
Rustless 17-C-100	Type 400C
Rustless 17-C-100FM	Type 440FM

A wide range of physical properties may be obtained by quenching from hardening heat. The high carbon grades are generally used in the hardened and stress-relieved condition.

Straight Chromium—Non-Hardenable

Rustless 17	Type 430
Rustless 17FM	Type 430F
Rustless 21	Type 442
Rustless 27	Type 446

Superior in corrosion resistance to above group. Generally used in annealed or soft condition.

Chromium—Nickel—Hardenable by Cold Work Only

Rustless 18-8	Type 302
Rustless 18-8	Type 304
Rustless 18-8FM	Type 303
Rustless 25-12	Type 309
Rustless 18-12-3Mo	Type 316
Rustless 18-10-Ti	Type 321
Rustless 18-10-Cb	Type 347

Highest corrosion resistance of all. Non-magnetic when annealed, becoming magnetic as cold worked. Exhibit extraordinary resistance to stress concentration.

How Stainless Is Fabricated

MACHINING AND CUTTING

Machining Stainless Steel is different, not difficult. Successful practice depends upon the application of proper techniques.

Machining operations require sharp tools rigidly mounted and operated at proper speeds using a cutting fluid, generally sulphur base oil. Attention should be directed to the non-magnetic or 18-8 grades as their machining is rendered very difficult if the tools are allowed to ride (glaze) and harden the surface to be cut.

Maximum machining rates are obtained with the "free machining" grades:

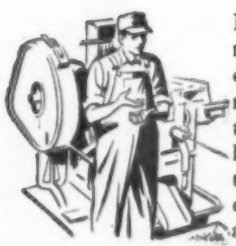
Rustless 12FM
Rustless 13-C-35FM
Rustless 17-C-100FM
Rustless 17FM
Rustless 18-8FM

For further information on machining write for Rustless comprehensive booklet, "Machining of Stainless Steels".

FORGING

The forging characteristics of Stainless Steels depend upon composition. Selection of suitable grades and proper control of forging temperatures insure successful forging of these alloys. With proper technique, Rustless Stainless Steels are readily forged in complicated shapes, such as dental and surgical instruments, valve bodies and table knives.

COLD WORKING



Rustless Stainless Steels are more resistant to cold deformation than ordinary steels, and more energy is required to shape them. However, they are readily cold-drawn, cold-headed and swaged when proper techniques are used. The straight chromium grades do not harden appreciably when cold-worked, but the chromium-nickel grades harden rapidly.

WELDING

Rustless Stainless Steels, except the high-carbon and free-machining grades, can be welded by the electric arc, oxy-acetylene, atomic hydrogen and resistance methods. The chromium-nickel grades are frequently chosen because of their particular ease in welding and unusual ductility in the welded condition. Weldments of heavy sections, or those subject to severe corrosion which cannot be annealed after welding are generally made from Rustless 18-10Cb—Type 347 or Rustless18-10 Ti—Type 321.

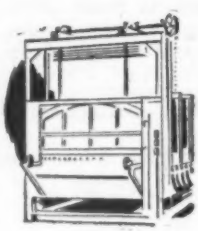
SOLDERING

Rustless Stainless Steels are readily soldered by ordinary methods and the only requirement is a soldering flux which will dissolve the passive film present.

RIVETING

When using rivets of Rustless Stainless Steels, certain properties, such as work hardening, air hardening and grain growth at given temperatures, must be given consideration.

HEAT TREATMENT



Rustless Stainless Steels of the "Martensitic" or hardenable types respond to heat treatment in a manner similar to low alloy steels. Large sections are hardened uniformly to the center when air cooled from above the critical temperatures.

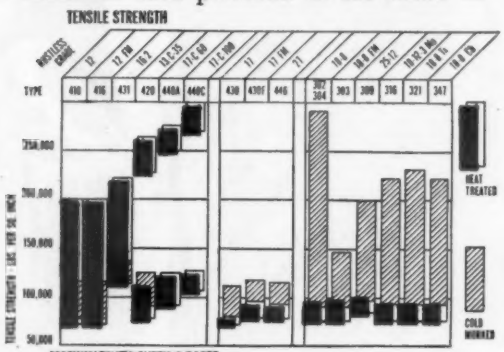
To attain full advantage of the excellent corrosion resisting and mechanical properties of Stainless Steels, proper attention should be paid to certain heat treating variables. These variables are easily understood and are simply controlled. Complete information can be obtained by writing for Rustless' booklet, "Heat Treatment of Stainless Steels".

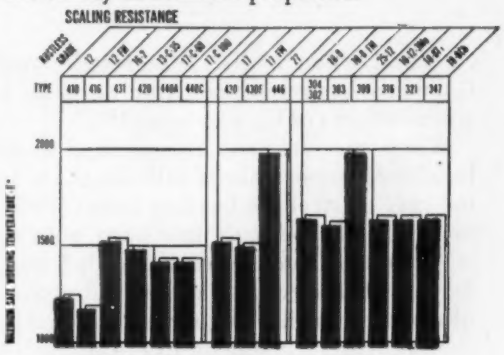
Rustless Stainless Steels can be surface hardened by special nitriding methods now commercially available. These methods can be used where the service demands a hard and wear resistant surface and where loss in corrosion resistance can be tolerated.

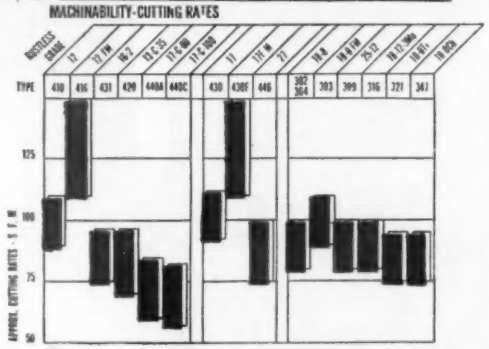
Comparison of Stainless Properties

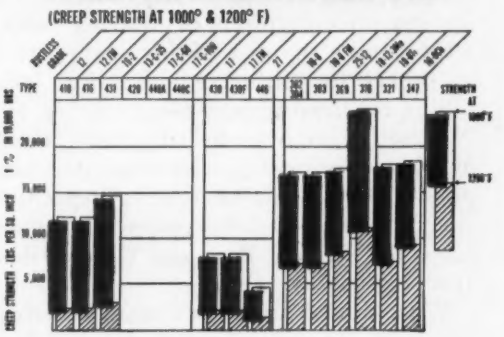
Selection of the proper Stainless Steel involves the evaluation and comparison of the characteristics of each grade with respect to specific functional and fabrication requirements. There is no easy rule to follow. Experience is an important factor, and that is why we urge designers to place the details of their problems in the hands of Rustless specialized stainless steel engineers and metallurgists.

Below are four charts out of a number shown in the Rustless folder, "Condensed Data on Stainless Steels" (sent free on request). These are for preliminary study only, and illustrate a few of the wide variety of available properties.







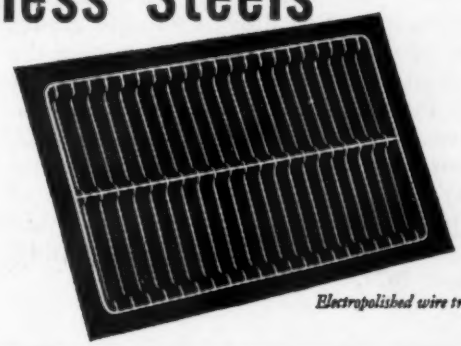


Electropolishing Stainless Steels

New uses for Stainless Steels are appearing as a result of the anodic electropolishing process developed by the Rustless laboratories. Commercial experience over the past four years has shown that many products which heretofore were too costly or impossible to polish by buffing or tumbling can be economically and efficiently cleaned and brought to an unusually lustrous and brilliant finish by this process.

For example, Rustless Electropolishing permits polishing of intricately-formed wire products, resistance-welded wire products (removes spot weld discoloration), parts too small to hold against wheels, deeply-recessed and complex parts, and rough forgings.

Write for further details about this Rustless development.



Electropolished wire tray

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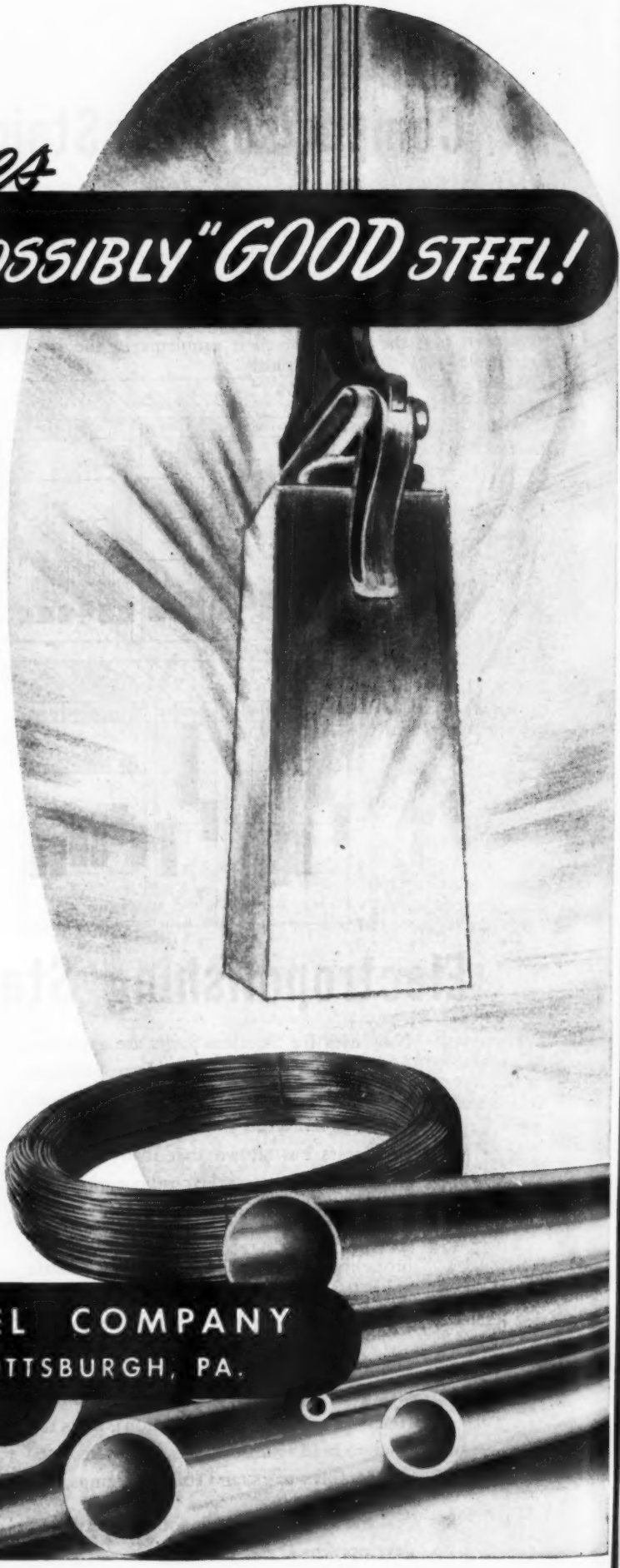
Producing STAINLESS STEELS *Exclusively*

RUSTLESS IRON AND STEEL CORPORATION

BALTIMORE 13, MARYLAND

Sometimes IT TAKES "IMPOSSIBLY" GOOD STEEL!



. . . and when it does Pittsburgh Steel Company has often been able to make it when others couldn't or wouldn't.

When specifications are so rigid as to be almost impossible of fulfillment, as in the case of steel for bearing backs, Pittsburgh Steel Company has been able to make steel of such extraordinarily clean, flawless character that it accepts the mirror-like plating for bearing surfaces perfectly. Consequently Pittsburgh has been both a leading manufacturer of bearing back tubing and a supplier of this quality steel to others for ultimate conversion into tubing for bearing purposes.

Likewise, in open-hearth alloys, *Pittsburgh quality* steel has achieved the "impossible" by meeting magnetic inspection specifications, when necessary, on orders for Alloy Tubing, Bars and Wire of that specified quality.

What does Pittsburgh's manufacturing emphasis on quality mean to you? Just this . . .

When you buy *Pittsburgh* bars, wire and tubing, in carbon alloy or stainless grades you know that the ability to produce the highest *quality* steels enables you to apply *any* Pittsburgh Steel products with confidence that they will do the job intended. Thus, even though your own specifications may be less rigid, the extra margin of dependability assured by *Pittsburgh* skill in steel making is well worth getting! Dept. 1671.

PITTSBURGH STEEL COMPANY

GRANT BUILDING PITTSBURGH, PA.

WYCKOFF *Precision* COLD FINISHED STEELS

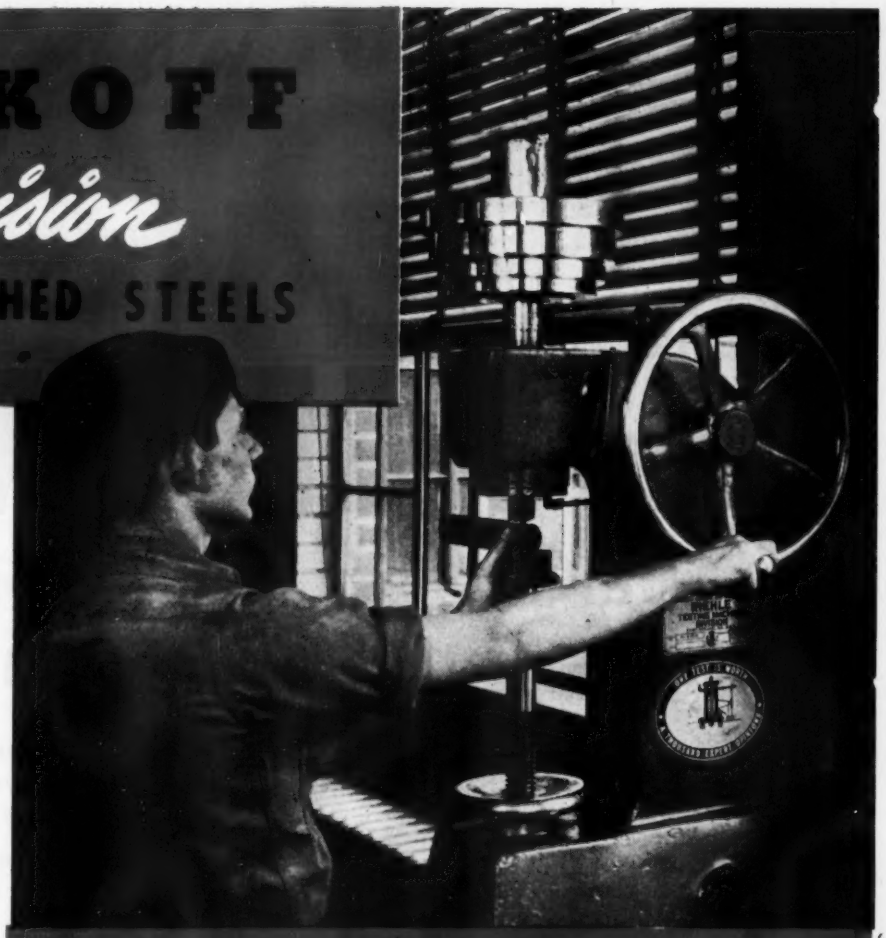
FOR

MAXIMUM MACHINABILITY

IMPROVED TOUGHNESS

MINIMUM WARPAGE

HIGHER STRENGTH VALUES



Wyckoff Heat Treated, Cold Finished Bars give steel fabricators a more dependable, easier working steel, having more uniform grain structure, greater strength and ductility. No heat treatment after machining is necessary thus saving costly heat treating, straightening and cleaning operation time.

Wyckoff metallurgists will be glad to work with you, now, on your post-war cost reducing planning.

ARMY-NAVY (E)

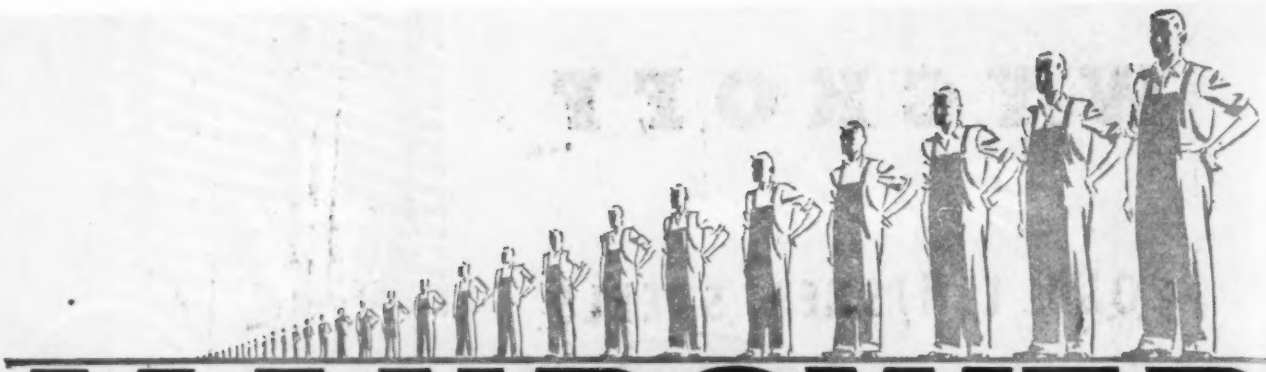
COLD FINISHED STEEL WYCKOFF

WYCKOFF STEEL COMPANY

General Offices: PITTSBURGH 30, PENNA.

Works: AMBRIDGE, PENNA.; CHICAGO, ILL.
NEWARK, N. J.; PUTNAM, CONN.

Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Plate up to 12" x 2".
COMPLETE ANNEALING AND HEAT TREATING FACILITIES



MANPOWER

. . . is at its BEST in Plants Equipped with Efficient DUST and FUME CONTROL!

Getting more men *into* war production is only part of the manpower problem. Equally important is the need for keeping more men *on* the job after they get there.

In war plants and general industries throughout the nation, dust and fume control systems planned, designed, and installed by Kirk & Blum have aided materially in maintaining top production by reducing absenteeism.

Workers' health and efficiency are reliably safeguarded by thorough removal of harmful dust and fumes from the air. Adequate ventilation is provided, accident hazards reduced. Plant efficiency and economy are promoted through protection of machinery and equipment against rapid deterioration.

Whatever the nature or extent of your manufacturing operation, you'll be wise to put your dust and fume control problem in the hands of recognized specialists—Kirk & Blum "air engineers". Their expert planning and unbiased counsel constitute your best assurance of lasting satisfaction. For further details, write to

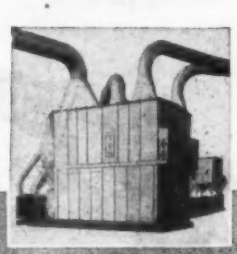
The KIRK & BLUM Mfg. Co.

2823 SPRING GROVE AVE., CINCINNATI 25, OHIO

Wet process air cleaning using Rotoclone.

Combination of centrifugal separator and dry filter.

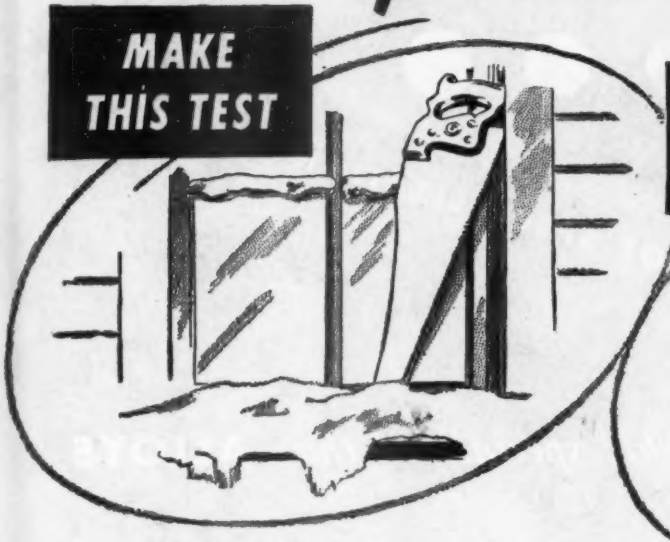
Centrifugal separator suitable for heavy dust concentration.



Clean dry returnable air required. Cloth filter selected.

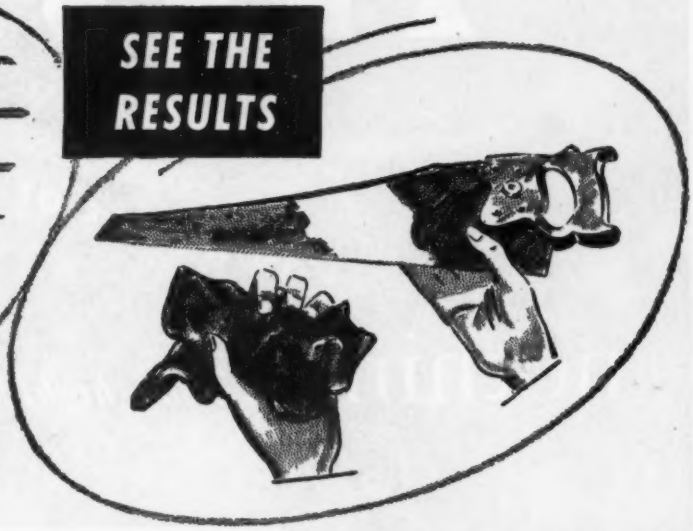
How to *prevent* Corrosion

MAKE THIS TEST



Coat a section of any piece of raw metal with a protective film of Anti-Corrode. Place it out-of-doors, and leave exposed to the elements.

SEE THE RESULTS



Rain, snow, changing temperature, dust and grime have eaten into and oxidized the unprotected metal. But note surface under Anti-Corrode film—bright and unharmed, in its original state.

CITIES SERVICE ANTI-CORRODE is a safe rust and corrosion preventive that brings amazing results. It is a reliable safeguard against corrosion of metals in any form or state of finish—whether in storage or in transit. Anti-Corrode forms a tenacious, durable film that is impervious to moisture and the more common gases prevalent in the atmosphere. And, since it contains lubricating material, it need not be removed in drawing operations. Anti-Corrode is made in several grades to meet specific requirements and severest tests. It is economical, easy to apply and can be removed with kerosene or any petroleum solvent.

This TEAM Will Save You Money and Materials

Recently, we announced the development of Cities Service Rust Remover, and responses to the demonstration offer far exceeded our expectations. Rust Remover, of course, *removes* rust. Anti-Corrode is designed to *prevent* rust and corrosion. Together, they will safeguard your equipment and war production—for the duration!

Take advantage of this FREE ANTI-CORRODE demonstration offer
Mail this coupon today!

(Available only in Cities Service marketing territory EAST of the Rockies.)

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NEW YORK · CHICAGO
IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
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CITIES SERVICE OIL COMPANY
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nothing *is more highly specialized than* ALLOYS

WITH RUBBER, GLASS, PLASTICS, fibers, light metals—we have entered on a period of such specialization of materials as was never before known. And nowhere are compositions and processes more minutely differentiated than in the metallurgy of iron and steel.

Specialization in this field means more use and more discriminating use of alloying elements. It means adaptation and exact control of processes. Thousandths of one per cent of such an element as Boron, or some other minute variation of formula, or a few degrees of temperature, perhaps, even in the higher ranges of heat treating, may greatly affect the useful properties of the resulting iron or steel. Economical and successful production depends on the scientist and the technician as never before.

As a leading supplier of Molybdenum, Tungsten, and Boron in their various forms, the Molybdenum Corporation has prepared helpful information and advice on the most advanced applications of these three much-discussed elements. Inquiries are welcomed.

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THAT'S what it amounts to when our B-29 fortresses pay Hirohito a visit. For in these mighty ships are vital die cast parts made by Auto-Lite in their Die Casting Plant at Woodstock, Illinois.

There are complete facilities, at Woodstock, for zinc and aluminum die casting, production and precision machining, a wide variety of finishes and a completely modern testing laboratory. Such integration of manufacture simplifies your job of production, makes more certain the meeting of your requirements in precise detail.

For information about how our facilities can help solve your problem, write

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Die Casting Division
WOODSTOCK, ILLINOIS

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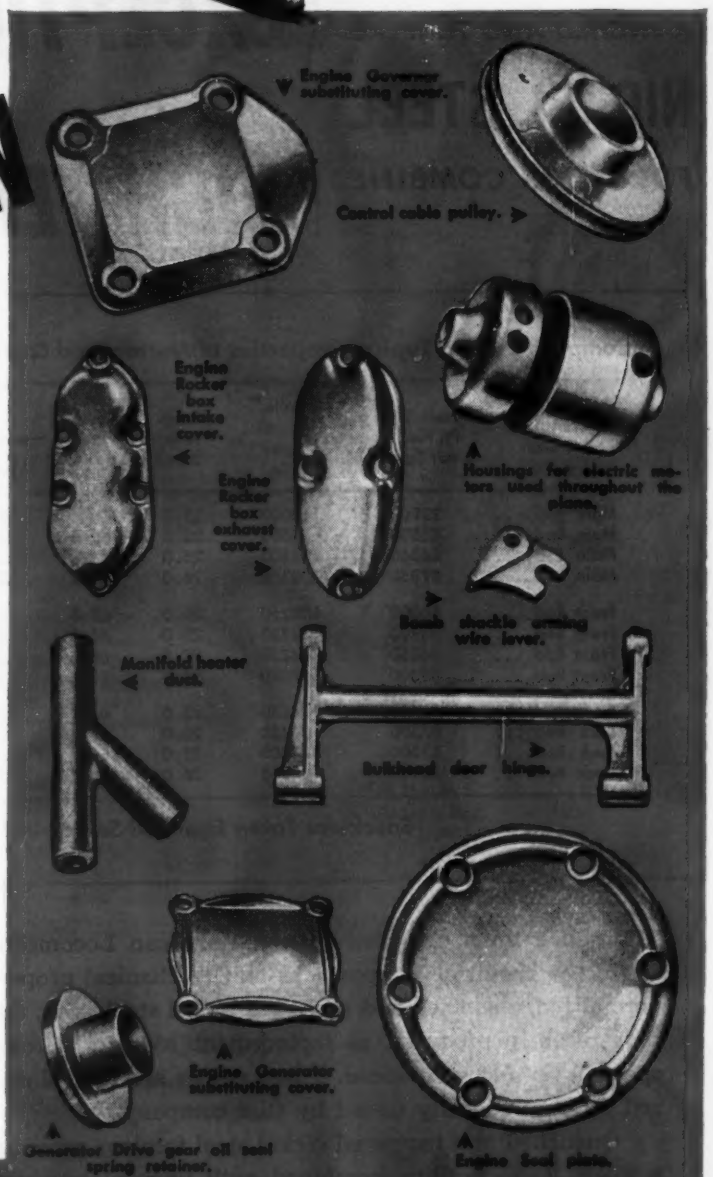
CHICAGO 5, ILLINOIS

723 New Center Bldg.
DETROIT 2, MICHIGAN

Buy War Bonds


Engine Governor substituting cover.
Control cable pulley.
Engine Rocker box intake cover.
Engine Rocker box exhaust cover.
Housings for electric motors used throughout the plane.
Bomb shackle arming wire lever.
Manifold heater duct.
Bulkhead door hinge.
Engine Generator substituting cover.
Generator Drive gear oil seal spring retainer.
Engine Seal plate.

AUTO-LITE Die Casting

2¼% Nickel Steel locomotive rods, one bent cold to show ductility.

QUENCHED AND TEMPERED

NICKEL STEEL FORGINGS COMBINE EXCEPTIONAL DUCTILITY WITH HIGH TENSILE STRENGTH

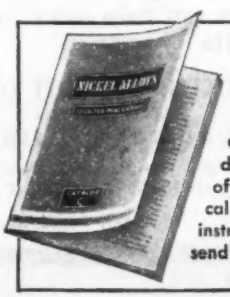
Composition and Typical Properties of Normalized Quenched and Tempered 2¼% Nickel Steel Rods

Description or Size	Melt Yield Pt. No. #s per Sq. In.	Tensile Strength #s per Sq. In.	Elong. % in 2 In.	Reduction in Area %	ANALYSIS					
					Car.	Mang.	Phos.	Sul.	Sil.	Ni
Main Rod....	92900	110000	25.0	64.4	.31	.78	.027	.026	.25	2.75
Main Rod....	86500	104500	25.5	65.6	.32	.86	.034	.032	.29	2.69
Main Rod....	86360	104400	26.0	64.8	.32	.86	.034	.032	.29	2.69
Main Rod....	87850	102350	26.0	66.2	.31	.89	.037	.025	.32	2.69
Front Rod....	86000	102250	25.0	67.3	.29	.82	.035	.027	.24	2.71
Front Rod....	83900	104250	25.0	66.1	.29	.82	.035	.027	.24	2.71
Front Rod....	86850	104250	27.0	66.1	.32	.86	.035	.025	.30	2.65
Front Rod....	89500	107050	25.5	65.6	.32	.86	.035	.025	.30	2.65
Back Rod....	89500	107650	25.0	62.7	.30	.79	.030	.025	.22	2.71
Back Rod....	87500	106450	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	87000	105600	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	88150	104850	26.0	66.8	.29	.82	.035	.027	.24	2.71

Specimens Taken from Mid-Section of Prolongations of the Forgings

The above table compiled by the American Locomotive Company shows the chemical compositions and mechanical properties of some normalized, quenched and tempered nickel steel front, main and back rods recently produced as replacement rods for locomotives being speeded up and rebalanced. These values are typical of replacement rod forgings recently tested by that company.

Quenched and tempered nickel steel forgings provide high tensile strength and ductility, combined with unusual toughness and high fatigue strength—qualities which tend to obviate breakage and assure long, trouble-free service when employed in heavy duty machinery and equipment.



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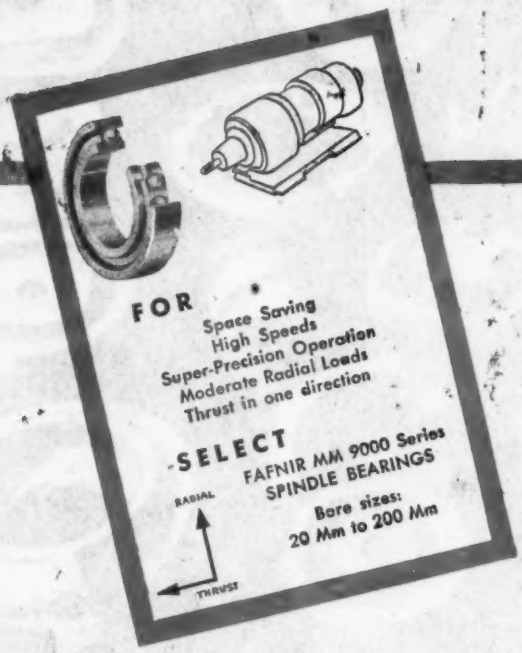
★ ***Nickel*** ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall Street, New York 5, N.*

FOR A POSTWAR WORLD OF USES



FOR

Space Saving
High Speeds
Super-Precision Operation
Moderate Radial Loads
Thrust in one direction

SELECT

FAFNIR MM 9000 Series
SPINDLE BEARINGS

Bore sizes:
20 Mm to 200 Mm

FOR

Heavy Thrust Loads
Moderate Speeds
Axial Rigidity

SELECT

FAFNIR THRUST BEARINGS
(Rigid or Self-aligning Types)

Bore sizes:
10 Mm to 140 Mm

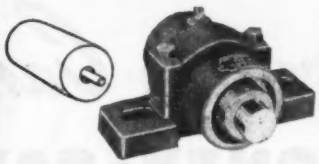
FOR

Light Radial Load
Moderate Thrust Load
(Either Direction)
Normal Speed
Intermittent Service

SELECT

FAFNIR 200 Series
RADIAL BEARING

Bore sizes:
10 Mm to 110 Mm



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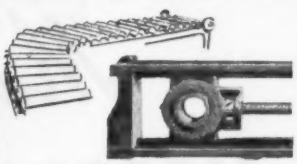
Combinations of Heavy
and Extra-Heavy Loads
Medium Speeds
Positive Sealing against
Dust and Dirt
Easiest-of-all Application

SELECT

FAFNIR DOUBLE
PILLOW BLOCKS
with exclusive Wide Inner
Ring Ball Bearings

For shaft sizes:
$1\frac{3}{16}$" to $6\frac{15}{16}$"



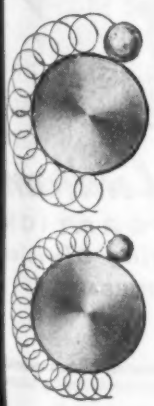
FOR

Shaft Adjustment or Belt
Tightening Conveyors
Self-alignment within the
housing
Friction-free operation

SELECT

FAFNIR BALL BEARING
TAKE-UP UNITS

For shaft sizes:
$\frac{3}{4}$" to 4"



1,000,000 LESS REVOLUTIONS!

These simple diagrams make it easy to understand why Fafnir Ball Bearings stay on the job longer and provide greater radial and thrust capacity.

Here are two ball bearings identical in size and type. But the balls in the Fafnir are $\frac{17}{32}$", those in the others are only $\frac{15}{32}$". These smaller balls must revolve faster per shaft rotation. In 24 hours at 2000 R.P.M. the Fafnir balls make *over a million less revolutions.* Obviously, fewer revolutions within the Fafnir Ball Bearings mean less wear, longer life.

This Fafnir Balanced Design brings race depth, ball size and ring thickness in proper balance for top performance. The Fafnir Bearing Company, New Britain, Conn.

★ 2170

FAFNIR

BALL BEARINGS

Make YOUR *Cams this* MODERN MONEY-SAVING *Way*

Investigate FCC Cast to Shape Air Hardening Steel Cams For These Machines:

Bookbinding, Boot and Shoe, Bottling, Box Making, Breaking and Crushing, Brick and Tile, Can Making, Candy, Canning, Carpet Weaving, Cigarette and Cigar, Creamery and Dairy, Dredging and Excavating, Electrical, Envelope, Farm, Hoisting, Knitting, Laundry, Mining, Packaging, Paper Mill, Printing, Rubber Working, Rug Weaving, Screw, Textile, Vending, Washing, Woodworking, Wrapping.

IT WILL pay you to look into this method if you build or operate machines that use cams. Cast to shape from FCC Air Hardening Steel, your cams reach you with only an eighth-inch to be machined off, even from very intricate shapes. Of course this means big savings of time and material.

FCC Air Hardening Steel has great resistance to abrasion and an extremely high compressive strength. It machines readily and is easy to harden in air with unusual freedom from distortion and cracking. Cams made from it give remarkably long wear.

Full information is available in a new booklet. Write for your copy or send your specifications for estimates today.

Prompt delivery under CMP.

ADDRESS DEPT. AM-36

Allegheny Ludlum
STEEL CORPORATION
Forging and Casting Division
DETROIT 20, MICHIGAN

W&D 9362

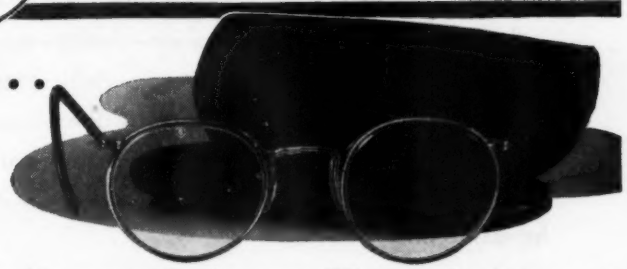
$194*

AVERAGE COST OF COMPENSATION & MEDICAL EXPENSES FOR ALL ACCIDENTS OTHER THAN EYE ACCIDENTS

$343*

AVERAGE COST OF COMPENSATION & MEDICAL EXPENSES FOR EYE ACCIDENTS

Eye Accidents Cost the Most . . . Are Easy to Prevent



Note how much more costly eye accidents are. Yet, according to conservative estimates, 98% of all eye accidents are preventable. The wearing of Safety Goggles practically eliminates the danger from eye hazards. And the price of such protection is low . . . only about $1.50 per employee.

Your Safety Director can show you how an adequate eye protection program can materially *reduce your production costs*. Why not let him work out the details with an AO Safety Representative? There's an AO Branch Office in every large industrial center.

*Figures from bulletin published by Department of Labor and Industry, State of New York.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

Trabon

TYPE M
POSITIVE CENTRALIZED LUBRICATION

costs so little—~~every~~ *no* machine owner can afford to ~~have it~~ *be without it*

● Here's the thing you've always wanted—positive—absolutely dependable lubrication—simple—easy to understand—easy to install—and unbelievably inexpensive. Now, you can avoid costly down-time while an oiler crawls around a machine lubricating each bearing manually, the breakdown if he misses one.

Make absolutely certain that every bearing on your machines whether large or small, moving or stationary, easy or difficult to reach receives just the desired amount of lubrication. Lubricate all the bearings on a moving machine member with just one flexible hose. Get full details—from our Bulletin No. 442. Send for a copy today.

TRABON
ENGINEERING CORPORATION

1819 *East 40th Street* • *Cleveland 3, Ohio*

ORIGINATORS AND PATENT OWNERS OF THE SINGLE LINE REVERSING LUBRICATING SYSTEM

Shaping things to come...

● Without in any way impeding our all-out war effort, Buffalo Bolt is ready now to discuss your fastener requirements for peace-time products.

BUFFALO BOLT COMPANY

ARMY E NAVY

NORTH TONAWANDA, N. Y.
SALES OFFICES IN PRINCIPAL CITIES

Ⓑ

The quality of Circle B products begins in our own rolling mill.

"The Only Ticket I Get For High-Speed Driving ... is the Inspector's OK Tag!"

...and he's making faster fastenings every day with AMERICAN PHILLIPS SCREWS

The slowest workers become highly efficient when you equip them with American Phillips Screws and power drivers. They're no longer slowed down by frequent fumbling and dropping, by crooked driving, or by screws with broken heads that must be backed out and replaced.

And the driving process itself is far faster, with American Phillips Screws. For the driving bit and screw align themselves into one straight driving unit . . . can't twist apart . . . don't have to be held in line by main strength. This permits the use of power drivers, multiplies man power, and gives maximum return on screw-driving costs, to small users as well as large.

The American brand of Phillips Recessed Head Screws is made under rigid laboratory check, and a unique system of piece inspection. Delivery service is maintained by high-speed production. And engineering service is at *your* service on any problem.

AMERICAN SCREW COMPANY
PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

Take a Recess from Slotted-Screw Costs and Troubles
...the Tapered, Engineered Recess of:

AMERICAN PHILLIPS Screws

PATENTS MAKE JOBS

Put the Screws on the Japs
BUY BONDS

Up here, the job calls for a *dependable* metal

High lines and sub-stations that carry surging energy require untold numbers of electrical connectors and accessories. This pole line hardware includes such items as turnbuckles, clamps, screws and rivets, washers, nuts and bolts . . . millions of them no bigger round than your little finger!

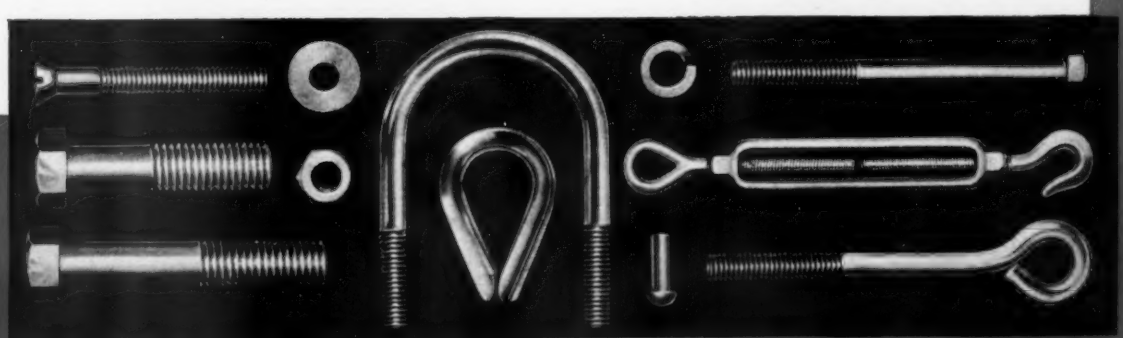
But these are not ordinary bolts and accessories . . . they must be strong and tough to withstand gales and storms and ever-changing temperatures. They must resist the corrosive action of gases and vapors in industrial centers; of saline seaboard fogs; humid gulf coast atmospheres.

Such a job calls for a dependable engineering metal, hence the ever-increasing use of Everdur*, The American Brass Company's Copper-Silicon Alloy, for applications that demand steel-like strength, high fatigue resistance and ready workability, combined with the corrosion resistance of copper. Many finished products of Everdur are available through leading manufacturers. Ask for Anaconda Publication E-6.

Other uses for this moderately-priced Anaconda Alloy are shown on the following page.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



*Reg. U.S. Pat. Off.

ANACONDA

Everdur Metal FOR POLE LINE HARDWARE

Everdur Serves and Saves in countless industries

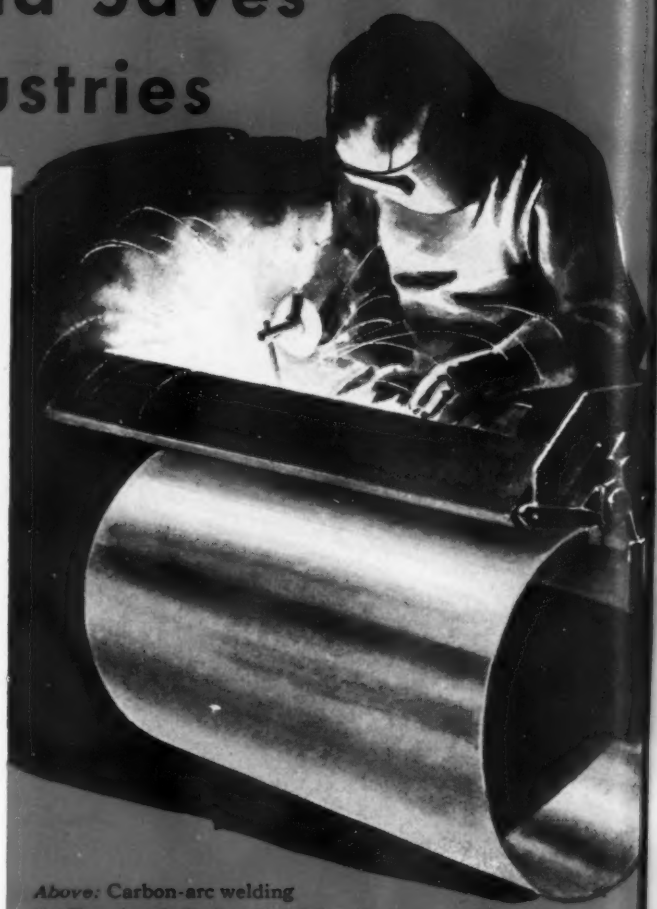
STRONG, tough and corrosion resistant, this weldable and workable Anaconda Alloy is saving countless dollars everywhere: In the electrical field; in railroad signal equipment; as a fastening metal in the marine field; for welded tanks and unfired pressure vessels; in water works and sewage treatment plants; for chemical and petroleum process equipment.

Everdur Metal, The American Brass Company's Copper-Silicon Alloy, is produced in practically all commercial forms—sheets, strips, plates, wire, rods, bars, shafts, tubes, shells, pipe, hot pressed forgings, casting ingots, drawn shapes and special products.

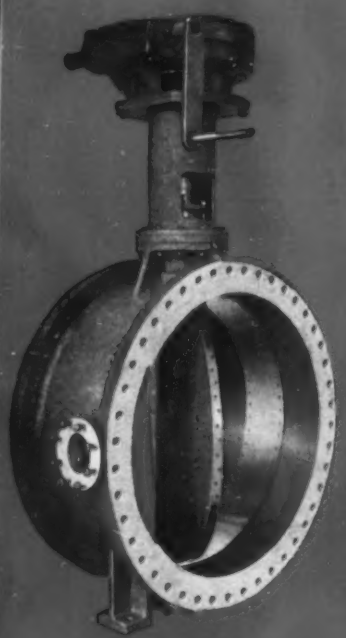
Everdur is regularly supplied in compositions suitable for hot or cold working and for fusion welding with rods of similar composition by either the oxy-acetylene torch or carbon arc. Your inquiries on Everdur will receive close attention by our Technical Department.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

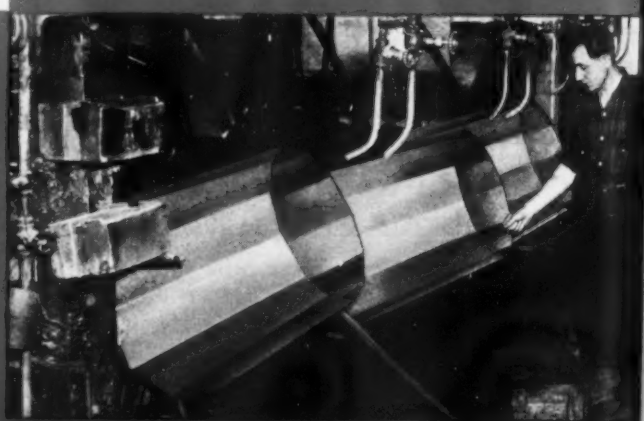


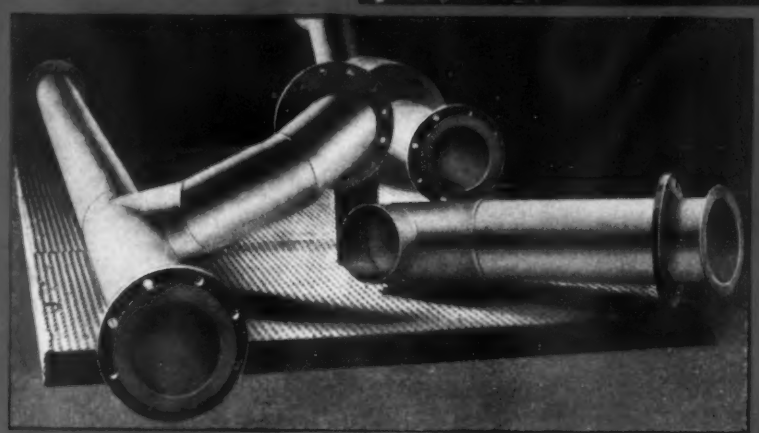
Above: Carbon-arc welding the Everdur shell of an "American" Sterilizer. Freedom from rust, corrosion resistance and ready workability are a few of its advantages.



Left: 48-inch, 7,390-lb. butterfly stop valve for hydroelectric station reinforced with Everdur on both sealing surfaces. Flange studs and nuts, packing gland and bolts are also Everdur.

Right: Everdur is ideal for wet tumbling of small parts—particularly in corrosive solutions. These barrels have been in continuous service for over nine years.





Left: Here's an e
ical way to make
pipe fittings. Th
fittings for 14-in
fabricated from
thick Everdur an
ed with Everdur

ANACONDA
from mine to consumer

45184

Everdur Copper-Silicon Alloy

No landing deck for them!

"Eyes of the fleet" are the pilots of cruiser-based scouting planes. Catapulted into the air they seek out enemy ships; radio their location and the effect of our gunfire.

But that's just part of their job. On a flight that covers thousands of square miles of ocean they may bomb or strafe light vessels and submarines, machine gun Jap airplanes, lay smoke screens.

On return, scouting planes must land near the motherships to be picked up by crane. There is no landing deck on a cruiser. They must hit the water after every flight!

Part of Star's job for the Navy is building the compact, powerful, shock-resistant motors for the hoisting cranes. Because motor failure could mean the loss of planes and men, the Navy was a "tough customer" when specifications for motors were written. But Star met those specifications – can meet yours when you have a difficult motor problem. Star Electric Motor Company, 200 Bloomfield Avenue, Bloomfield, N. J.

SATISFYING THE WORLD'S TOUGHEST CUSTOMER

Wanted—Your Tough Motor Problems

Star motor, above, was designed with the cooperation of engineers of the McKiernan-Terry Corp., Harrison, N. J., to power the crane that lifts scouting planes aboard cruisers.

Dozens of other types of motors designed and built by Star, are used on U. S. warcraft. While the Navy does not endorse any product, the fact that Star consistently satisfies "the world's toughest customer – the U. S. Navy" – is ample proof of the engineering ability of this 34-year old organization. If a standard Star motor (⅛ to 200 h.p.) does not meet your exact requirements we have the ability and the willingness to build one that does! Consult Star now.

STAR MOTORS

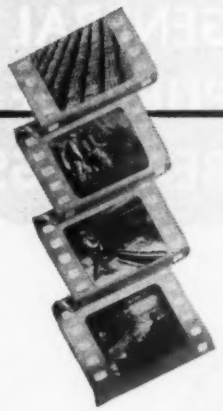
FROM REYNOLDS OWN MINES comes bauxite ore for Reynolds aluminum. Reynolds now mines more bauxite than was mined in the entire United States before the war.

ALUMINA, made from bauxite, is reduced to pure aluminum in giant electric pots or furnaces in Reynolds plant at Listerhill, Alabama. "Pot puncher" in the film is stirring alumina into molten cryolite.

SCENE AT ONE of the many rolling mills which turn out Reynolds plate and sheet aluminum. To date, Reynolds has rolled more square feet of light gauge aluminum than any other company. Reynolds plants are equipped to produce large tonnages of aluminum for post-war needs.

See This Film...

the dramatic story of ALUMINUM



HERE is a 34-minute educational film on aluminum that is jam-packed with interesting information on its processing... from the mining of bauxite, refining it to alumina, reducing the oxide to metal ... right on through to the rolling of sheet, rod and bar . . . and the manufacture of fabricated parts.

"A Recital of Faith"

This film, titled "A Recital of Faith," portrays the great advances in aluminum technology during the war years, and the infinite possibilities for aluminum in the post-war world.

Underlined is the part the Reynolds Metals Company is prepared to play in co-operation with engineers and manufacturers who are now using, or plan to use aluminum, and the new lightweight, high-strength aluminum alloys.

Showings Easily Arranged

More than 10 million people have seen "A Recital of Faith." Every audience that has seen it has praised it in glowing terms.

This film is now available, without charge, for showings before technical groups, engineering societies, manufacturers, clubs, purchasing agents, foremen training and other interested groups. 35 mm. or 16 mm. sound.

Write for It Now

Just address Reynolds Metals Co., Aluminum Division, 2500 S. Third Street, Louisville 1, Ky. On your letterhead, please.

REYNOLDS METALS

REYNOLDS ALUMINUM

The Great New Source of

INGOT • SHEET • SHAPES • WIRE • ROD • TUBING • FORGINGS • CASTINGS • PARTS • FOIL • POWDER

Uniform Quality

Specify JOHNSON GENERAL PURPOSE BEARINGS

Ready to use . . . .

No product ever achieves nation-wide popularity by accident. There must be real merit . . . genuine quality to bring about repeat sales. Johnson General Purpose Bearings have long been a distinct favorite with manufacturers of new equipment and with maintenance men. Cast in the correct alloy—S.A.E. 64—they deliver the utmost in performance for the longest period of time. This cuts replacement to a minimum. Completely machined—inside diameter . . . outside diameter and ends . . . they slip right into place without trouble or bother. The range of sizes—over 850—enables you to buy exactly to your requirements. Why not specify Johnson Bronze on your next order for plain cast bronze bearings? See for yourself the time and money you save. Learn the value of real quality. Reasonable service is available from stock.

Catalogue

New 72 Page Catalogue lists and describes the most complete bearing service available. It's FREE.

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

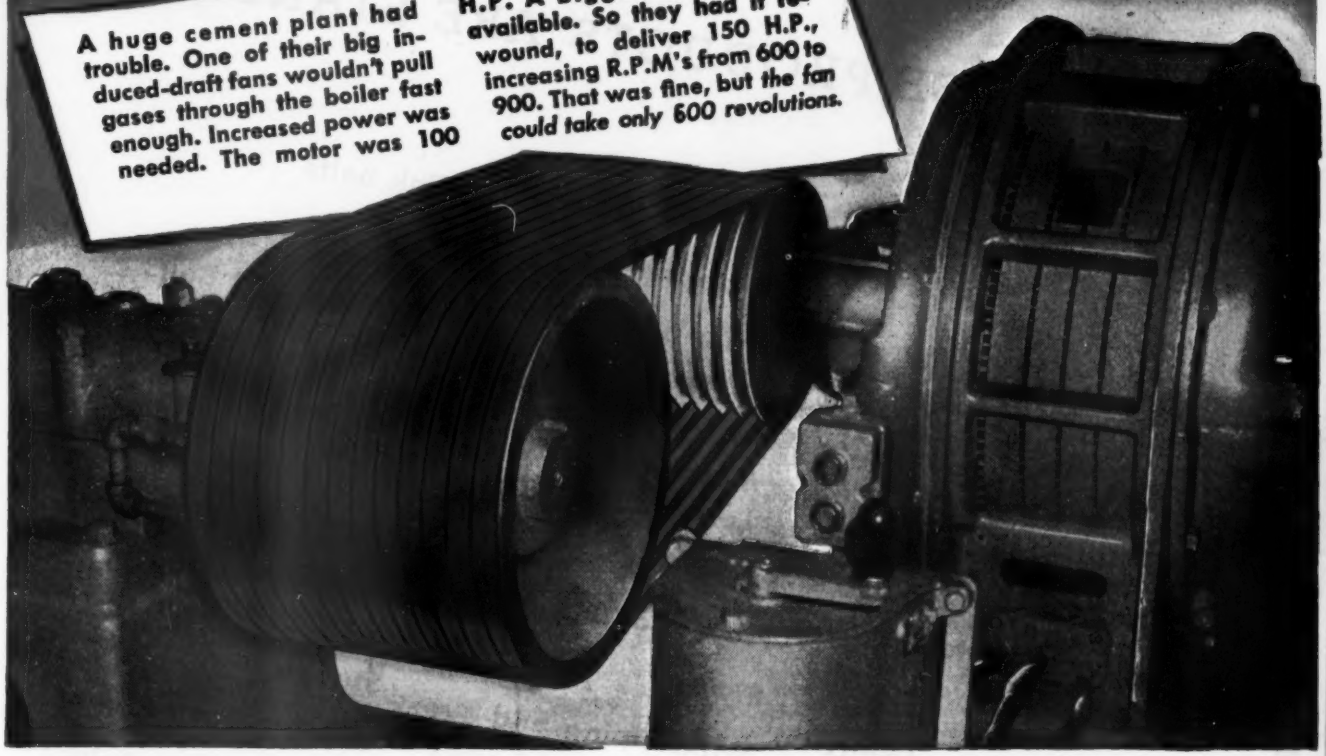
The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

515 S. MILL STREET NEW CASTLE, PA.

DAYTON V-BELT DISTRIBUTOR

CREATES *Unusual* SOLUTION OF

INDUCED-DRAFT FAN PROBLEM


A huge cement plant had trouble. One of their big induced-draft fans wouldn't pull gases through the boiler fast enough. Increased power was needed. The motor was 100 H.P. A bigger one wasn't available. So they had it rewound, to deliver 150 H.P., increasing R.P.M's from 600 to 900. That was fine, but the fan could take only 600 revolutions.

—So they called their Dayton V-Belt Distributor

He and a Dayton factory man supplied 13 Dayton V-Belts and installed them so as to cut the R.P.M's for the fan back to 600, still delivering from the faster running motor *more* than the increased H. P. required. The problem dissolved. That was 6 years ago. Their Dayton V-Belts have continued to drive smoothly ever since... without attention or maintenance, without trouble whatsoever!

You can easily get the same efficient help to improve your power-transmission drives. You simply call the Dayton V-Belt Distributor. He will help you quickly convert to Dayton V-Belts that are smooth-running, hard-gripping, and especially long-lasting.

Dayton Rubber's Technical Excellence gives you V-Belts which are pronounced as unsurpassed in mechanically correct design and in their quality of construction. Your Dayton V-Belt Distributor will save you money.

V-Belts by Dayton Rubber

REG. TRADE MARK THE DAYTON RUBBER MFG. CO.

The Mark Of Technical Excellence In Synthetic Rubber

CALL YOUR DAYTON V-BELT DISTRIBUTOR OR WRITE DIRECT

THE DAYTON RUBBER MFG. CO.

The World's Largest Manufacturer of V-Belts

DAYTON 1, OHIO

Dayton Rubber Export Corporation, 38 Pearl Street, New York, N. Y., U. S. A.

Cable Address: WIDBLOCO

KEEP ON BUYING WAR BONDS

If you want a bolt or screw...

ALL OF THESE PRODUCTS ARE STANDARD

- Cap Screws
- Carriage Bolts
- Carriage Bolts—Ribbed Neck
- Clips—Wire Rope
- Cotters
- Dardelet Rivet Bolts
- Elevator Bolts
- Heel Bolts
- Hub and Wheel Bolts
- Lag and Skein Bolts
- Lockwashers
- Lockwasher Screws
- Machine Bolts
- Machine Screws
- Nuts—HP, CP, SF, Castle, Machine Screw, Lock or Slotted
- Pipe Plugs
- Plow and Guard Bolts
- Rivets
- Self-Tapping and Sheet Metal Screws
- Set Screws
- Sink Bolts
- Skein Bolts
- Spring Center Bolts
- Spring Clip Bolts
- Step Bolts
- Stove Bolts
- Stove or Chair Rods—Headed and Threaded
- Studs
- Tire Bolts
- Weather-Tight Bolts

● Ask the draftsman, or design engineer, in a plant using bolts in assemblies, to name a few "standard" bolts and he may begin by naming "cap screws, lag screws, carriage bolts, machine bolts, and . . ."—then he is likely to stop to consider. Chances are, he has named all those with which he is familiar. But there are a great many more, as the long list of quite common "standard" bolts listed in the panel above reveals.

For instance, only a farm implement manufacturer would know that there are several types of "plow bolts"—standard bolts with implement manufacturers for generations. Some of these bolts are surprisingly like other bolts not used by implement

THAT MEETS ALL REQUIREMENTS AND IS EASY TO GET . . . . USE A "STANDARD" INSTEAD OF A "SPECIAL"

manufacturers, but by slight modification in dimensions and physicals serve other purposes.

Virtually all the bolts and screws used in the gigantic aircraft industry are almost exact replicas of existing bolts and screws used by other industries —excepting for materials of which they are made, more exacting fit and finish.

Frequently a customer designs a "special" bolt or fastening, assuming he cannot get or use a standard bolt. These "specials" require special dies, made of scarce die steels by even scarcer die-makers. Often critical materials are specified when less critical materials properly heat treated, would develop the required physicals. And all "specials" require special routing, handling and inspections throughout every step of their production.

Therefore we say, FIRST—find out from us if there is a standard bolt that may fit into your design. If there is not, perhaps you can re-design for a standard bolt *now,* saving time *later.* SECOND—determine if physicals can be met by less critical materials, heat treated to develop full strength. Lamson & Sessions maintains modern heat treating departments with chemical, physical and metallurgical laboratories manned by competent engineers. THIRD—if you cannot use a standard bolt, then call in a Lamson representative to discuss your problem. Out of his broad experience, he will probably be able to help you. And if you must have a "special" bolt tailored to your requirements, *we can make it on our bolt-making machinery faster than any other way.*

THE LAMSON & SESSIONS COMPANY, General Offices, Cleveland, O.
Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

"BOLTS, NUTS & SCREWS"—1944 REVISION. Cloth bound. Limited edition, 180 pages of technical, practical information. Sent prepaid for *$1.00—cash or check must accompany your order.*

"BOLTS ARE IMPORTANT!"—24-page booklet of currently useful information for buyers of headed and threaded products, and describing Lamson & Sessions' specialty fastenings which have wide industrial applications *—now, and in the post-war period. Sent gratis.*

"THE LAMSON BLUE BOOK"—is our standard Catalog of standard products excepting our Aircraft products. *Sent gratis.*

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks. *Sent gratis.*

HERE'S A COUPON FOR YOUR CONVENIENCE

THE LAMSON & SESSIONS COMPANY • 1971 West 85th Street • Cleveland 2, Ohio

Please send us ☐ Lamson Blue Book ☐ Bolts, Nuts & Screws ($1.00)
☐ Bolts are Important! ☐ Simplified Stock Sizes

Send information on ☐ Cap Screws and Set Screws ☐ Cotters
☐ Bolts ☐ Machine Screws ☐ Lamson Lock Nuts
☐ CP, HP, SF Nuts ☐ Lock-washer Screws ☐ Self-Tapping Screws

Name of Individual _____ Title or Kind of Work

Employed by (Name of Company) _____

Street Address _____

City and State _____

No. 1897—Copyright 1945—The Lamson & Sessions Co.

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

Contact KAYDON *of Muskegon*

FOR ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER

Few Attempt Such Manufacture

Typical of KAYDON'S successful specialization in difficult manufacture is this flat race ball thrust bearing 22.000" x 26.000" x 1.000". Races are only .3125" thick, held to .001" parallelism. Bearings are made 4" bore to 120" O. D.

As readily and economically as standard types and sizes are manufactured, KAYDON produces special bearings that banish the need for using "catalogued" bearings that fail to meet your exacting needs.

That is the *specialized* service, created by KAYDON to meet rigid wartime requirements of the U. S. Navy — available to industry as an economical means of product refinement. Atmospheric control in heat treating, rarely provided by special bearing manufacturers, is available at KAYDON. In addition, KAYDON offers added services in flame hardening, precision heat treating, metallurgical laboratories, microscopy and physical testing.

Counsel in confidence with KAYDON. While vital wartime requirements have precedence, capacity for general production is constantly increasing. Look ahead — and plan ahead — with KAYDON!

KAYDON *Types of Standard or Special Bearings:*
Spherical Roller • Taper Roller
Ball Radial • Ball Thrust
Roller Radial • Roller Thrust

THE KAYDON ENGINEERING CORP.

MUSKEGON · MICHIGAN

New in Name . . . Old in Experience

Special Motor Application . . . ***Improves Machine Performance . . . Meets Mechanical Specifications.*** Although standard off-the-shelf motors can often be used in a product, experience proves that when the electric motor is specially designed for a specific application, the machine operates better, more economically with less maintenance.

For over 50 years Holtzer-Cabot has concentrated its facilities in the design and application of special motors, such as those illustrated above, to meet specific design and performance requirements of such products as machine tools, instruments, business machines and aircraft. And although today, military requirements get first call on all of Holtzer-Cabot's motor production, our motor development engineers will gladly discuss your postwar fractional H.P. motor requirements with you. There is no obligation, of course.

HOLTZER-CABOT

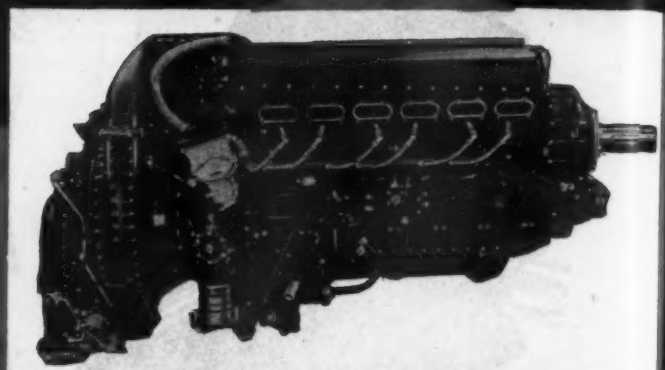
Division of First Industrial Corporation

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

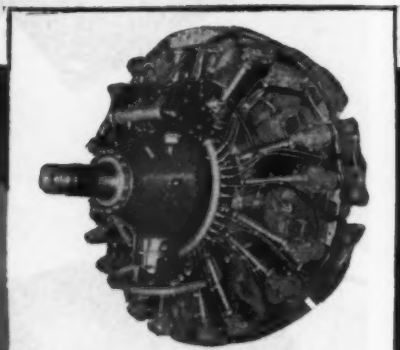
125 AMORY STREET, BOSTON 19, MASS. • NEW YORK, N. Y. • CHICAGO, ILL. • PHILADELPHIA, PA.

THE ANATOMIES OF AVIATION'S MIGHTY ENGINES are TOUGHENED in NICHROME* HEAT TREATING FIXTURES

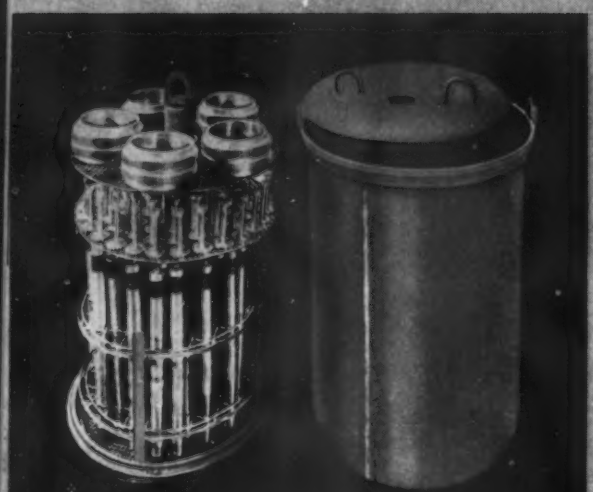
made only by Driver-Harris



The Packard-built Rolls Royce



2200 H.P. air-cooled type built by Wright



One of many versatile D-H heat-treating furnace fixtures used to carburize precision machined engine parts at Packard and Wright.

Manufactured under Driver-Harris Patent No. 2,230,310

IN THE heat-treating departments of the plants where these . . . the world's most powerful aircraft engines are born . . . *nothing* is left to chance in carburizing their precision machined parts. To make certain of perfect results *every time*, NICHROME* furnace fixtures, made exclusively by Driver-Harris, are used.

D-H Nichrome, best known and highest grade of all the nickel-chromium alloys, has been used continuously for 28 years by leading manufacturers. In company with the other widely used D-H alloys—Chromax* and Cimet* it is doing yeoman war service in the forms of boxes, pots, retorts, tubes, muffles, baskets and fixtures.

However critical your own heat-treating requirements may be, why not tell us about them, for, our engineers have yet to face a problem they can't lick with complete satisfaction.

Ask for a free copy of the Driver-Harris Heat-Treating Fixture Catalog. It's brim-full of interesting photos and important alloy data.

D/H SPECIAL PURPOSE ALLOYS SINCE 1890

Driver-Harris COMPANY

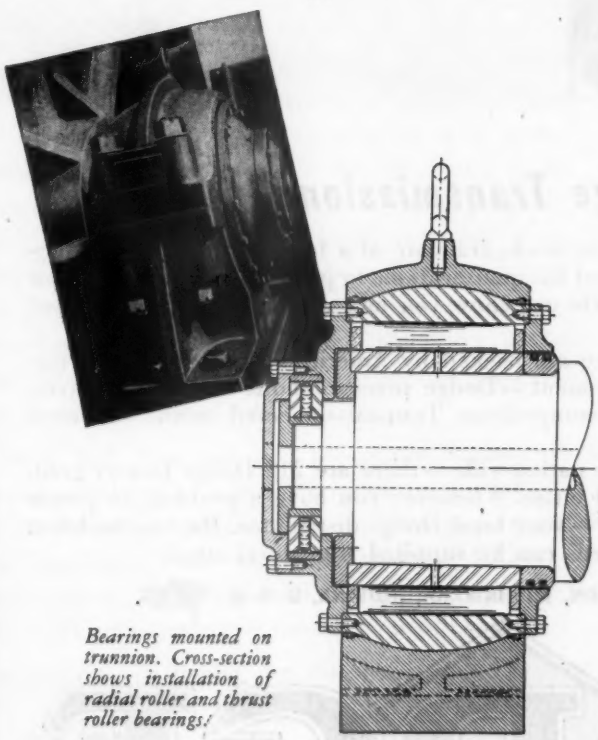
HARRISON, NEW JERSEY

ARMY E NAVY

Branches: Chicago • Detroit • Cleveland • Los Angeles • San Francisco • Seattle

*Trade Mark Reg. U.S. Pat. Off.

THIS BRIDGE LIFTS ON 12 TORRINGTON BEARINGS



Bearings mounted on trunnion. Cross-section shows installation of radial roller and thrust roller bearings.

The Lewiston-Clarkston Bridge was built across the historic Snake River to link the states of Washington and Idaho. Completed in 1939, it has a vertical lift span 200 feet long, weighing 1,428,800 pounds. Each of four vertical lift sheaves employs two Radial Roller Bearings and a Thrust Roller Bearing designed and built by Torrington's Bantam Bearings Division, having radial load capacity of 1,429,000 pounds; a thrust load capacity of 170,000 pounds at 5 r.p.m.

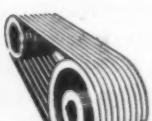
Today, Torrington Bearings are delivering the peak performance that results in smooth, dependable, low-cost operation, in bridges, steel mill and paper equipment, oil well machinery and many other types of applications. Avail yourself of Torrington's diversified experience in designing bearings for special applications whenever you have either a standard or unusual anti-friction problem.

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION
SOUTH BEND 21, INDIANA

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

HE KNOWS WHAT'S RIGHT IN POWER DRIVES



He Is The Dodge Transmissioneer

He's a specialist in putting power to work, graduate of a factory course. That insignia on his lapel means he has proved his qualifications to prescribe the most efficient power drive to meet your needs. He can show you new and better ways to put *all* your power into the job.

His knowledge and experience are backed by America's broadest line of mechanical power transmission equipment—Dodge precision-built bearings, sheaves, pulleys, clutches and other drive components. Transmissioneered means advanced design in power drives.

Transmissioneering service is nation-wide—there are 210 Dodge factory graduate Transmissioneers in principal cities. Whenever you have a problem in power application, call a Transmissioneer—your local Dodge distributor. He has the latest answer. Often your immediate needs can be supplied from local stock.

DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA, U. S. A.

DODGE

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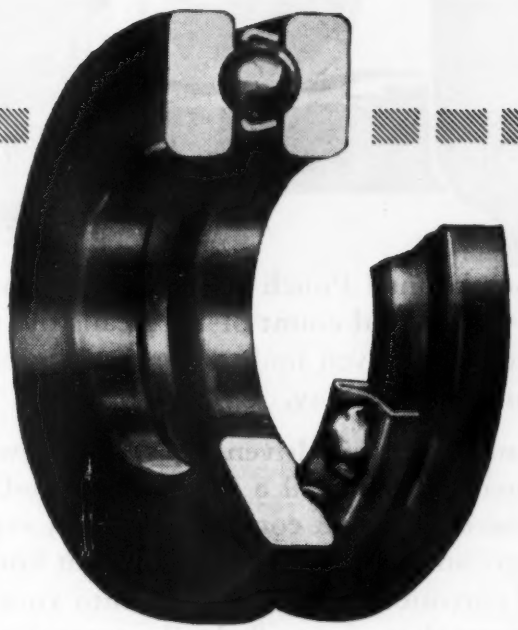
THE RIGHT DRIVE FOR THE JOB

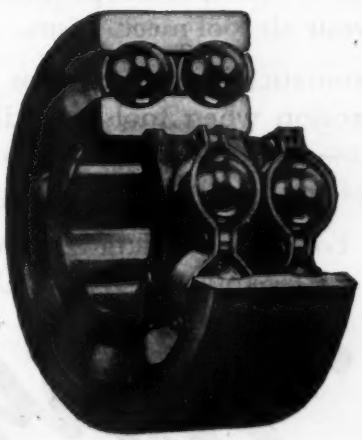
HOW MUCH DO THE *Bearings* COST THE *Designer?*



LEADING designers with reputations to guard . . . their own as well as their company's . . . carefully consider the bearings *when designing the equipment.* They know that properly selected bearings mean increased customer satisfaction for equipment makers . . . improved performance for equipment users. Carelessly selected bearings can cost a designer his reputation . . . the right bearings can improve his position by boosting his company's repeat sales:

BCA Ball Bearings are accurately engineered for varying speeds and loads . . . sturdily constructed for long life. Equipment makers can rely on them to promote equipment efficiency . . . and equipment users can be sure that they will require minimum maintenance. BCA engineers will gladly help you select the right bearings for present and future applications.

BEARINGS COMPANY OF AMERICA • LANCASTER, PENNA.



BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

PUNCH!

Punch counts! Punch in the ring, from the starting bell to the final count of 10 means the title. Punch in your air driven tools means more production, not 1 but 3 shifts a day.

Be sure *your* air driven tools keep new tool punch permanently. Install a Norgren Lubro-Control Unit in the air lines. It consists of—*filter, regulator, plus gauge,* and the *lubricator.* The Unit knocks out rust and corrosion and puts punch into your production. It shoots clean, controlled, oil-saturated air to all parts of your air tool mechanism.

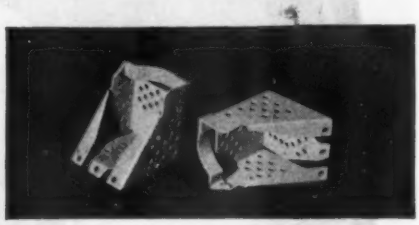
Automatic; starts and stops with the tool. Prevents corrosion when tools are idle. Installed in a short time—lasts a life time—saves the operator plenty, too. Sizes and types for every purpose.

For complete data write to C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado.

Norgren

PRECISION PARTS

STAMPING OUT FUTURE MIRACLES



These little, multi-holed, stamping assemblies are a part of important electronic equipment. Today, they ride in great bombers on a mission of death. Tomorrow, this same equipment in one form or another, will have an important part in the miracles of post-war living.

The whole job, right from the part print, was handled by Ace. Ace designed the tools, and built them in their modern tool and die shop. Ace presses stamped them out accurately and quickly.

Ace offers other manufacturers this same blueprint-to-finished-parts service. If you are thinking of small parts or assemblies calling for stamping, machining, heat-treating, or grinding, you'll find Ace offers the modern ingenuity and carefully controlled production that result in highly accurate work, delivered when promised. Send sketch, blueprint, or sample for quotation.

Send for this Ace booklet and keep it in your post-war planning file.

ACE
TRADE MARK

ACE MANUFACTURING CORPORATION
for Precision Parts

ARMY-E-NAVY

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

LIBERATOR OF MOTOR BURNOUTS

To get relief from motor burnouts, always buy motors with built-in Klixon Motor Protectors. They're available as a built-in feature with A.C. motors all sizes; D.C. motors up to 30 volts.

Here's how they insure full motor life . . . when a motor overheats and becomes dangerously hot, the Klixon Protector snaps the power "off" thus preventing a possible burnout. Then when the motor cools sufficiently, it turns the power "on" again either automatically or by manual reset depending on the type of protector you specify.

Klixon protection is reliable . . . it protects motors year in and year out, starting and stopping a motor every time it overheats until the trouble is remedied.

Guard against motor burnouts . . . specify Klixon Motor Protectors with every motor you buy. They're built into the motor by the motor manufacturer providing a tested and proven combination of protector matched to the motor.

KLIXON MOTOR PROTECTORS

SPENCER THERMOSTAT CO., ATTLEBORO, MASS.

Fighting Friction in a HOT SPOT!

Middleby-Marshall travelling tray oven which uses eight cartridge type and two pillow block type Link-Belt roller bearings.

Middleby-Marshall revolving tray type oven equipped with four pillow block Link-Belt roller bearings.

LINK-BELT ROLLER BEARINGS

Help Roll Out the "Rolls"

● Bake oven service is hard on bearings. Sustained high temperatures make lubrication a tough problem, and uniform high quality of baked products demands uninterrupted operation. A builder of travelling and revolving tray ovens for bakeries in all parts of the continent, has chosen Link-Belt Roller Bearings for this vital service. Scientific design and precision workmanship assure free rolling action under severe conditions of misalignment and varying combinations of thrust and radial load. Their rugged construction and high efficiency, make Link-Belt Roller Bearings the logical choice for locations such as shown here. Data Book 1775-A will help *you* select the size and type for your tough bearing jobs. Send for a copy today.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Toronto 8. Offices, Factory Branch Stores and Distributors in principal cities.

9059-A

LINK-BELT
BALL AND ROLLER BEARINGS

NEED SOME LARGE SPRINGS NOW?

Coiling equipment forms bars up to 2½" diameter

LARGE SIZE springs can now be supplied at a speed that will "perk up" your production schedules. Extensive manufacturing facilities at Muehlhausen are responsible, where one entire plant is devoted to hot-coiled springs.

Besides quick, quantity delivery, you get two other important advantages from this hot-coil specialization: Design of your springs by Muehlhausen engineers to best meet operating conditions; extra spring life gained by "production lab" control of all processes.

See how these springs are made—SEND FOR NEW ILLUSTRATED FOLDER ON HOT-COILING SPRINGS.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
125 Michigan Avenue, Logansport, Indiana

To improve product performance, use

MUEHLHAUSEN Designed SPRINGS

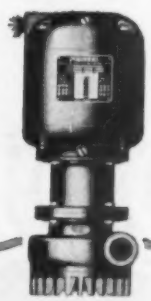
THERE'S A

PIONEER PUMP

FOR YOUR JOB!

IN FACT there's a PIONEER Pump for virtually EVERY job . . . . because there are 400 standard models in the great PIONEER Pump family. And they are the "longest-lived" pumps ever built . . . . with rugged dependability built right into every one of them.

PIONEER Pumps were designed by a group of machine tool engineers . . . . men who knew the importance of having a dependable and constant flow of coolant for the very machines which they were designing. As a result, PIONEER Pumps are doing a day-in and day-out job on busy production lines everywhere.



PIONEER MODEL "VS"
(VERTICAL SHORT)

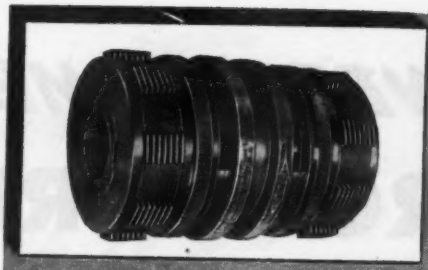
This model is designed for use in shallow tanks or chip pans without covers. The pump grille can rest directly on the bottom of the pan—and, if necessary, without clamping or holding brackets. The outlet boss may be specified assembly 90° or 180°.

When you have a pumping problem . . . . remember PIONEER . . . . the name that means the answer to all pumping problems.

400
Standard Models to Choose From

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

Pioneer Pump & Manufacturing Co.
19651 JOHN R ST. • DETROIT 3, MICHIGAN



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MAXITORQ

floating **DISC CLUTCH**

FOR POSITIVE AND PRECISE CONTROL

MAXITORQ design has definitely solved the problem of positive and accurate control of precision machines. Discs ride free in neutral, spaced by Maxitorq Separator springs . . . no drag, abrasion or heat. Smooth power pick up; quick, positive disengagement. Assembled, adjusted or taken apart without the use of tools. Single, double types, wet or dry, ¼ to 5 H.P. at 100 rpm.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER . . . CONNECTICUT
SEND FOR CATALOG NO. A33

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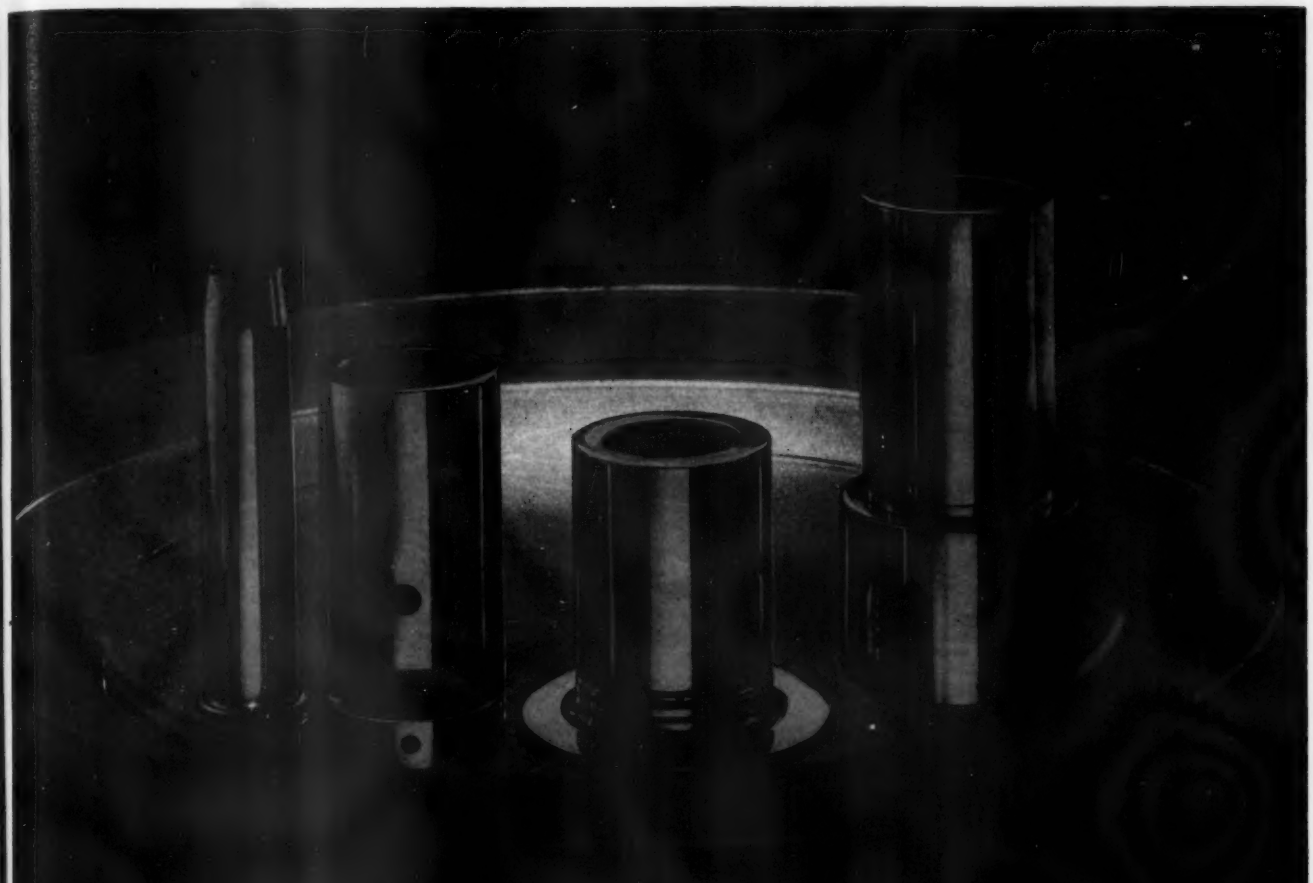
≡ 0-80 and ≡ 1-72
SCREWS and NUTS
Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
WALTHAM, MASS.



Bunting today produces Cast Bronze Bearings of superlative quality... In precision, in fineness of finish, in uniform physical and metallurgical qualities they surpass any Cast Bronze Bearings ever before produced in volume... Developed for war they are fit for the finest machines of peace. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in principal cities.

Bunting

BRONZE BEARINGS ★ BUSHINGS ★ PRECISION BRONZE BARS

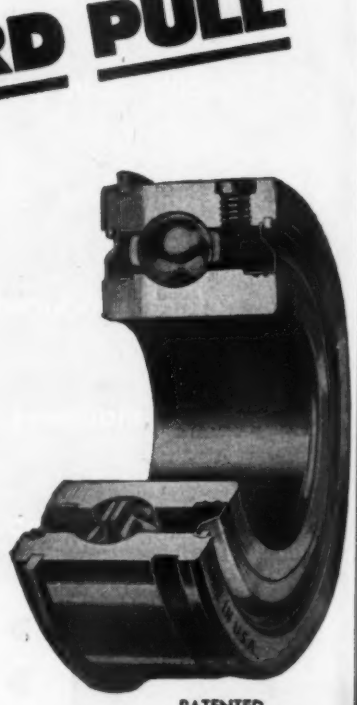
THAT EXTRA SOMETHING...

FOR THE LONG, HARD PULL

IN AN ATHLETE, it is called "STAMINA." In a ball bearing, it is DURABILITY—and it is determined by the inbuilt features that safeguard against wear and break-down.

The NORMA-HOFFMANN "CARTRIDGE" BALL BEARING has all these vital features, developed to the last degree:—wear-less, friction-free, all-metal seals (removable and replaceable) sealing lubricant in and dirt out, regardless of shaft angle, at least double the grease capacity of any other single-row bearing. A design that holds the grease ON THE ROLLING SURFACES, where it is most effective.

Read about these, and other, valuable features of the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING in the Catalog, sent on request. Or, ask our nearest office to have one of our Field Engineers call and explain.



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NORMA-HOFFMANN BEARING CORPORATION

STAMFORD, CONNECTICUT ★ Founded 1911

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.

Why more forgings in your postwar product?

—FORGINGS FOR MAXIMUM STRENGTH AND TOUGHNESS—

Machine designers are working with the fact in mind that definite improvements will be expected in the machine of tomorrow, whether it be used in the factory, on the highway or in the home. Among the advances anticipated is more dependable performance, with greater freedom from breakdowns and operating delays.

Logically, improvement along this line can frequently be obtained through the broader use of forgings, which provide metals at their ultimate strength and toughness, with maximum resistance to tensional, torsional and compression stresses. Forged parts are also more able to withstand severe impacts, and embody the high fatigue resistance which results in longer service life.

The "why" of the greater strength of forgings is revealed in the etched view of the crankshaft shown. The fibrous structure is initiated in the rolling of the forging billet. This is intensified and the grain flow advantageously directed in the forging process, with concentration of grain structure (toughness) at the points of greatest shock and strain. It is this controlled grain flow which largely imparts to forgings their high resistance to stresses and impact. Too, in forgings, grain flow and physical properties can be made to conform exactly to the requirements of the part.

Kropp Forge has produced enormous quantities of forgings for the exacting requirements of aircraft and ordnance makers. Kropp forgings will improve the performance of the machines of tomorrow. When you need flat die, drop or upset forgings, call the nearest Kropp engineering representative, or write direct for information.

KROPP FORGE COMPANY
5301 W. Roosevelt Road, Chicago 50, Illinois
Engineering Representatives in Principal Cities

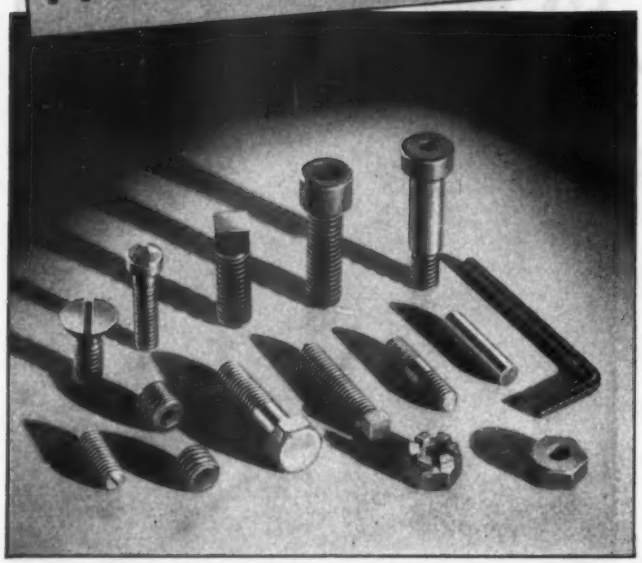
The drop hammer imparts maximum strength to metals

The advantageously directed grain flow in this crankshaft was obtained by the forging process

The cam shaft forgings shown are assured maximum stress resistance

SERVING INDUSTRY 18 SINCE 31 OVER 100 YEARS
KROPP FORGE CO
KROPP
ARMY ★★ E ★★ NAVY

Accurately Dimensioned . . . Perfectly Threaded



If you haven't sold yourself on the merits of "Chicago" Standard Screw Products, you owe it to your company to make exacting tests and comparisons . . . Take one each of the 15 different Chicago Screw Stock Products . . . Spread them out in front of you, and examine them carefully one by one.

Check with a micrometer or thread gauge. Put under a microscope or magnifying glass. Pull down screws with a tension indicating wrench . . . You'll find "Chicago" Standard Screw Products compact and tough . . . accurately dimensioned . . . perfectly threaded. By any and every test or comparison—they are unsurpassed for the needs for which they are made.

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. HOMAN AVENUE CHICAGO 24, ILL.

Why you should order the

FLEXLOC STOP and LOCK NUT

Pat'd—Pats. Pend.

Because:

- It is of one-piece construction
- It can be made of any of the conventional nut materials
- Every thread—including locking threads—takes its share of the load
- Its construction is especially advantageous for low and thin nuts
- It accommodates itself to a very wide range of thread tolerances
- It can be used over and over again without losing its ability to lock
- It is not affected by temperatures likely to be met with in the field of Mechanical Engineering
- Being a "stop" nut, it stays locked in any position on a threaded member.

MILLIONS IN USE
Sizes from No. 6 to 1" diameter
Write for Bulletin 582

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. BOX 4
—BRANCHES—
Boston • Detroit • Indianapolis • Chicago • St. Louis • San Francisco

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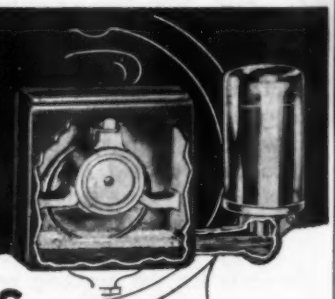
OIL LEVEL ALWAYS CONSTANT



As long as you keep oil in the unbreakable, transparent reservoir you know your bearings are getting just the right amount of oil. This Gits engineering achievement will not permit either starving or flooding of bearings. Easy to fill—oil reservoir tilts back on hinge—content of reservoir is always clearly visible. Also available with bayonet type reservoir. Send us an outline of your problem for Constant Level Oiler recommendations.

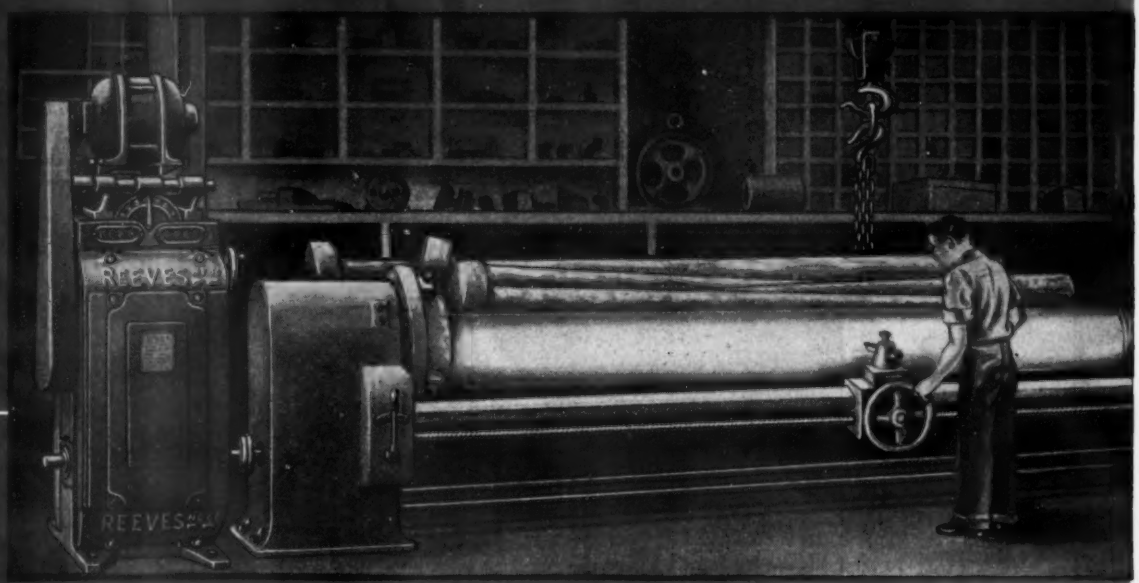
Write for your copy of 172 pages of lubricating data.

GITS BROS. MFG. CO.
1857 South Kilbourn Avenue • Chicago 23, Illinois

Exclusive for over 35 years

HOW REEVES STEPS UP PRODUCTION

OF PROPELLER SHAFTS FOR LIBERTY SHIPS



40-Hour Job Cut to 23 Hours by Applying Reeves Variable Speed Transmission to Lathe in Operation from 19 to 24 Hrs. Daily for 2 Years

● Typical of the ingenuity and "know how" which made America "The Arsenal of The Democracies" is the story about two small West Coast machine shops.

To machine the huge propeller shafts for Liberty ships, so urgently needed in the Pacific War, every possible facility was pressed into service. These shafts were from 13″ to 20″ in diameter, and from 17 to 22 feet long. They were too large for lathes ordinarily found on the West Coast, but this did not stop the shop owners.

The first shop converted a big old belt-driven lathe to provide modern controlled speed operation, with a large REEVES Variable Speed Transmission. Production was stepped up from one completed shaft every 40 hours, to one finished every 23 hours.

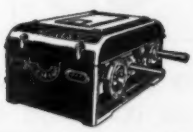
The ingenuity of the other shop proprietor was equally interesting. He built his own lathes out of concrete and old automotive parts, and with controlled speed provided by REEVES transmissions, is turning out finished shafts in greatly increased numbers.

In both of these applications REEVES Speed Control made possible the maximum peripheral cutting speed at every stage of the processing of these lathes.

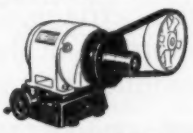
Here again, the adaptability, accuracy and rugged strength of REEVES Speed Control contribute to the war effort. Write for copy of 96-page Catalog AM-450.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

THE 3 BASIC REEVES UNITS



VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range—2:1 to 16:1 inclusive.



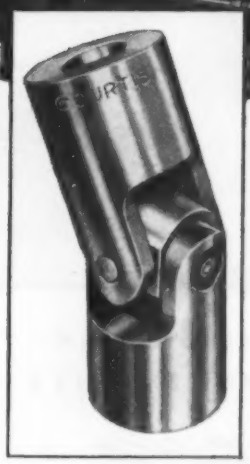
VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit, speed ratios 2:1 to 6:1 inclusive.

REEVES *Accurate Variable* **SPEED CONTROL**

CURTIS UNIVERSAL JOINTS

Photo courtesy of Jones & Lamson Machine Co.



...IN SHELL PRODUCTION

A Curtis Universal Joint plays an important part in this Jones & Lamson Fay Automatic Lathe, which is tooled to machine shells for our Armed Forces.

In connecting a profile attachment for the carriage, Curtis Universal Joints are helping in the daily production of ammunition that is so vitally needed.

Just one more application where quality, reliability and proven low cost maintenance of Curtis Universal Joints are meeting the demands of all-out war production.

Let Curtis Engineers, with their 20 years of knowledge, help you with your universal joint problems. This experience is yours for the asking.

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

SOLE DISTRIBUTORS, BOSTON GEAR WORKS, NO. QUINCY, MASS.

If the WAR SHOULD END Tomorrow

We would be most happy. Making every effort to increase vital production will bring an earlier peace.

GUSHER COOLANT PUMPS

have proven a dependable aid in increasing the production of machine tools. Install Gusher Coolant Pumps on your bottle-neck machines NOW.

Shown here is our new model HL-15025-B.

Send for new catalogue showing complete line of models.

MODEL HL-15025-B

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump for Modern Machine Tools

USE BALL BEARINGS on this CRANKSHAFT?

YOU CAN **IF** THEY'RE **SPLIT** BALL BEARINGS

SPLIT Bearings are made with divisible races — fit on crankshafts, gear clusters, shaft flanges, accessory drives, connecting rods, compressors and other applications where it is mechanically impossible to use solid race bearings.
The division is made by a unique fracturing process — the ultimate in simplicity and accuracy.
Ball or Roller — Radial or Thrust types. Easy to install or remove. SPLIT Bearings deliver same performance as a solid race bearing. Made to ABEC 1 tolerance.
Send for Catalog A.M. 3-45

Split
BALLBEARING CORPORATION
Manufacturers of Dismountable Race Bearings
LEBANON • NEW HAMPSHIRE • U. S. A.

START AND ACCELERATE *Smoothly* with RELIANCE V•S DRIVE!

(Photo courtesy Western Electric Co.)

Each of these wire-twisting machines is driven and controlled by its individual Reliance V•S Drive—for *smooth* starting and *smooth* acceleration.

V•S is an all-electric, adjustable-speed drive, operating from AC circuits, through which starting, stopping and speed changes are effectively controlled, automatic reversal provided at any desired point and tension properly maintained. The possibilities of Reliance V•S Drive in helping to speed production and cut costs are almost limitless. It will pay you to investigate.

Four rubber-covered conductors and the plastic center filler are twisted into "Spiral-4" cable for use on the fighting fronts by this battery of machines, at the Point Breeze Works of the Western Electric Company.

Here, as in many other applications, Reliance V•S Drive has provided the smoothness and flexibility of control which are vital to speed and quality of production. Low creeping speeds for adjustment virtually eliminate wastage, starting and acceleration are free from jerks or irregular motion and both quantity and quality of production are maintained at a high level.

For complete information as to the possibilities of Reliance V•S Drive, call the nearest Reliance office, or write for Bulletin 311.

RELIANCE ELECTRIC & ENGINEERING CO.

1075 Ivanhoe Road • Cleveland, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston
Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.)
St. Louis • San Francisco • Syracuse • Washington, D. C. • and other principal cities

RELIANCE A·C D·C MOTORS

"Motor-Drive is More Than Power"

STANDARD ENGINEERS NOTEBOOK

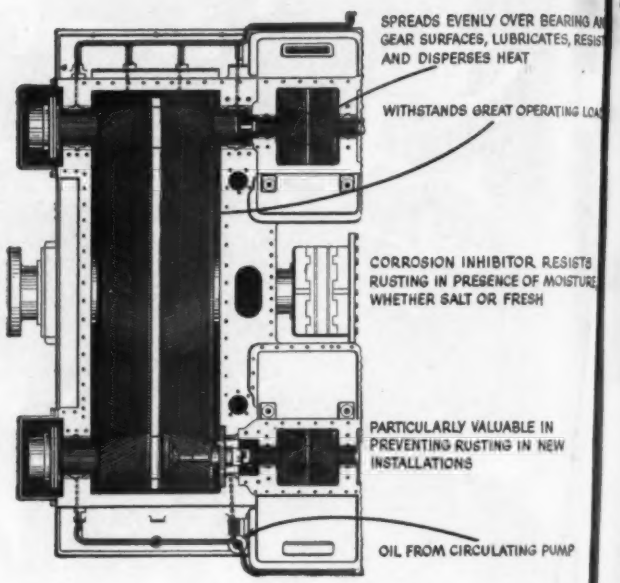
VOL. 2-W, No. 3

Compounded turbine oil stops rust damage

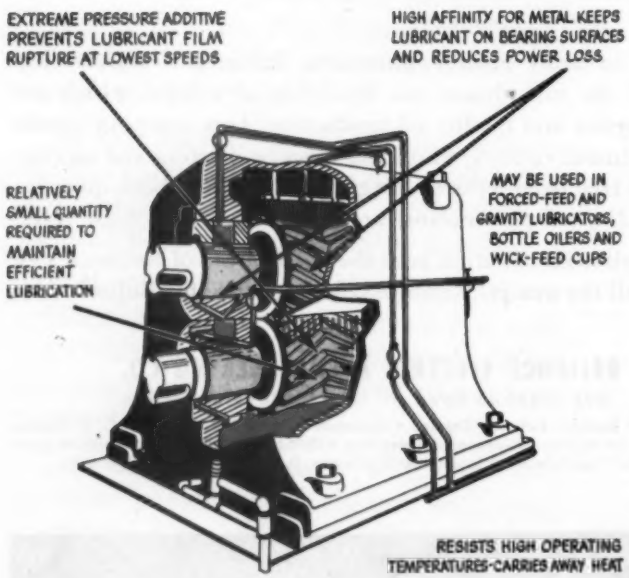
When rusting is a problem in double reduction steam turbines, either because of sweating or leakage of fresh or salt water, Calol Deturbo Oil 19X is recommended. It eliminates the usual danger of rusting in new installations when first charged, and gives full protection throughout their lives.

Calol Deturbo Oil 19X is a compounded oil, made from selected crudes. It contains a highly effective rust inhibitor. In official tests, steel strips immersed in mixtures of Calol Deturbo Oil 19X and both fresh water and synthetic sea water showed no sign of rusting after 48 hours.

Because of its high film strength, Calol Deturbo Oil 19X carries the heavy weight imposed on turbine bearings, prevents wear and consequent rotor misalignment. It separates rapidly from water with a minimum of sludge formation, and is non-corrosive. Calol Deturbo Oil 19X fully meets U. S. Navy specification for 2190-T turbine oil.



Vistac gives gears extra protection



As the name "Vistac" implies, Calol Vistac Oils ar both viscous and tacky giving them a high affinit for bearing surfaces. An oiliness and extrem pressure additive provides unusual film strengt

They assure full protection to heavy duty gears such as industrial reduction sets, on which ex treme pressures are exerted over wide areas f a relatively long time. They are extremely eff cient. Adequate quantities may be supplied to gea by the usual lubrication methods—forced fee and gravity-lubricators and sight-feed cups; t lighter grades by bottle-oilers and wick-feed cup

Calol Vistac Oils are also outstanding for t lubrication of rock drills, hammers and other a tools. They atomize quickly, are stable and un form, and retain their fluidity at low temper tures. They are made in six grades: 9X (SAE 10 14X (SAE 20), 19X (SAE 30), 28X (SAE 40), 36X (S 40), 45X (SAE 40).

Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert help — make your maintenance job easier. Call your Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California.

STANDARD OF CALIFORNIA

Fabricating magnesium —like other metals— requires only simple precautions

Good housekeeping— plus established magnesium shop practices— keeps production moving

etting best results in magnesium fabrication has en a highly productive Dow research program for good many years. Not only in Dow's own complete ops, but also in the many other plants that use agnesium as a standard production metal, operations e speeded by following simple, well-defined shop ocedures.

is largely involves "good housekeeping"—the type plant practice that modern manufacturers observe a matter of course: machines and floors should be t reasonably clean; sensible clothing should be worn; approved fire extinguishers should be kept on hand.

Beyond that, specific techniques—quite similar to those used with other metals—expedite the manufacture of magnesium products in the full variety of common fabrication methods.

These procedures . . . as they apply to magnesium fabrication in your own shop . . . are available to you from Dow technicians thoroughly versed in the field. Call the nearest Dow office for consultation.

DOWMETAL

magnesium

THE METAL OF MOTION

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2. **Our steadfast policy of maintaining pre-war standar with no compromise in quality, is being rigidly ma tained.**

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Buy Horsepower by

HOWELL ELECTRIC MOTORS COMPA

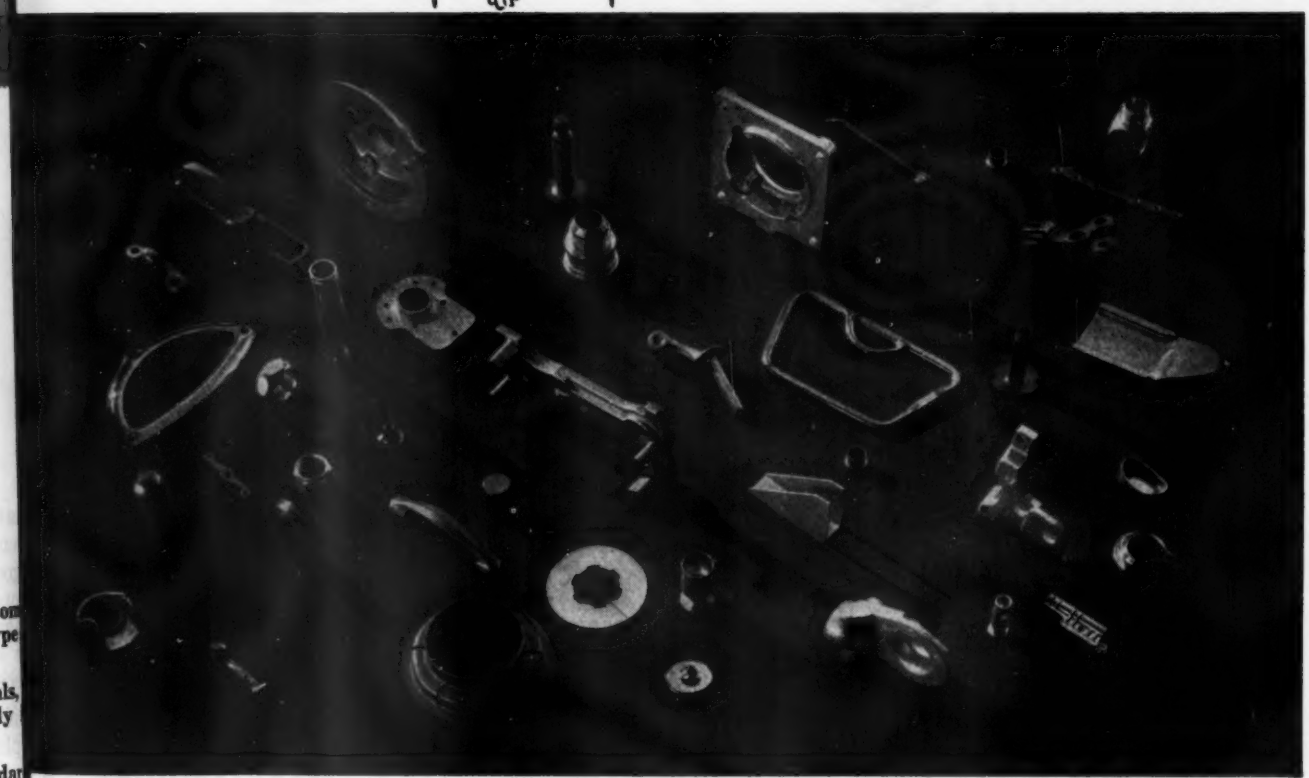
HOWELL, MICHIGAN

Manufacturers of Quality Motors Since 1915

You ask?

CAN ROTO-FINISH DE-BURR AND FINISH THESE PARTS FASTER?

A prominent customer* answers—
"It doubled our production while replacing 15 workers."



This statement is typical from manufacturers using Roto-Finish for de-burring and finishing. Because it is a precision mechanical process, Roto-Finish is far speedier than tedious hand de-burring operations. Enormous quantities of parts are finished and de-burred in a fraction of the time required by hand. What's more, one operator alone can handle several Roto-Finish machines, resulting in a great labor saving, and permitting transfer of skilled labor to other work.

Another advantage is the absolute uniformity of radii produced by Roto-Finish. This method is particularly recommended for precision parts where there must not be the slightest dimensional change.

Learn the advantages Roto-Finish can offer by sending samples for processing. It's being done by the best companies, and there's no obligation. *Also write for new folder describing Roto-Finish.* The Sturgis Products Co., 504 Jacob St., Sturgis, Mich.

*Name on file.

HE PROVED MECHANICAL PROCESS—
FOR GRINDING • DE-BURRING • POLISHING • HONING • COLORING

ROTO FINISH
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THE STURGIS PRODUCTS CO.
504 Jacob Street, Sturgis, Michigan.

☐ Send booklet "How to Slash De-Burring Costs" ☐ Interested in processing samples

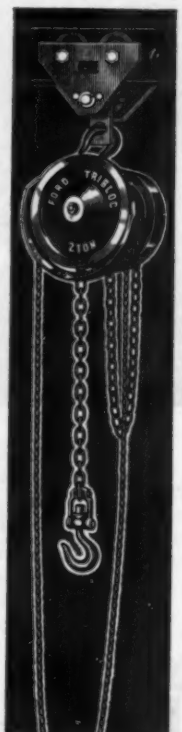
Name_____

Address_____

SIMPLICITY IS THE KEYNOTE

of FORD TRIBLOCS

FORD TRIBLOC's design is simplicity itself. And the fewer the parts—the better the machine. The **FORD TRIBLOC** has the least number of parts of any hoist in its field. Fewer parts mean less opportunity for wear, greater efficiency, lower maintenance cost. When you buy a **FORD TRIBLOC** you get a simple, ruggedly durable hoist that, with ordinary care, will last a long time.



FORD TRIBLOCS are especially built for constant hard usage; ideal where high-speed production counts. Spur gear construction, ball-bearing load wheels, both high tensile strength and elasticity in load chain, and many other features assure enduring efficiency. Capacities: ¼ to 40 tons.

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Self-contained units for carrying away dust-laden air around grinding, cutting, polishing and buffing wheels.

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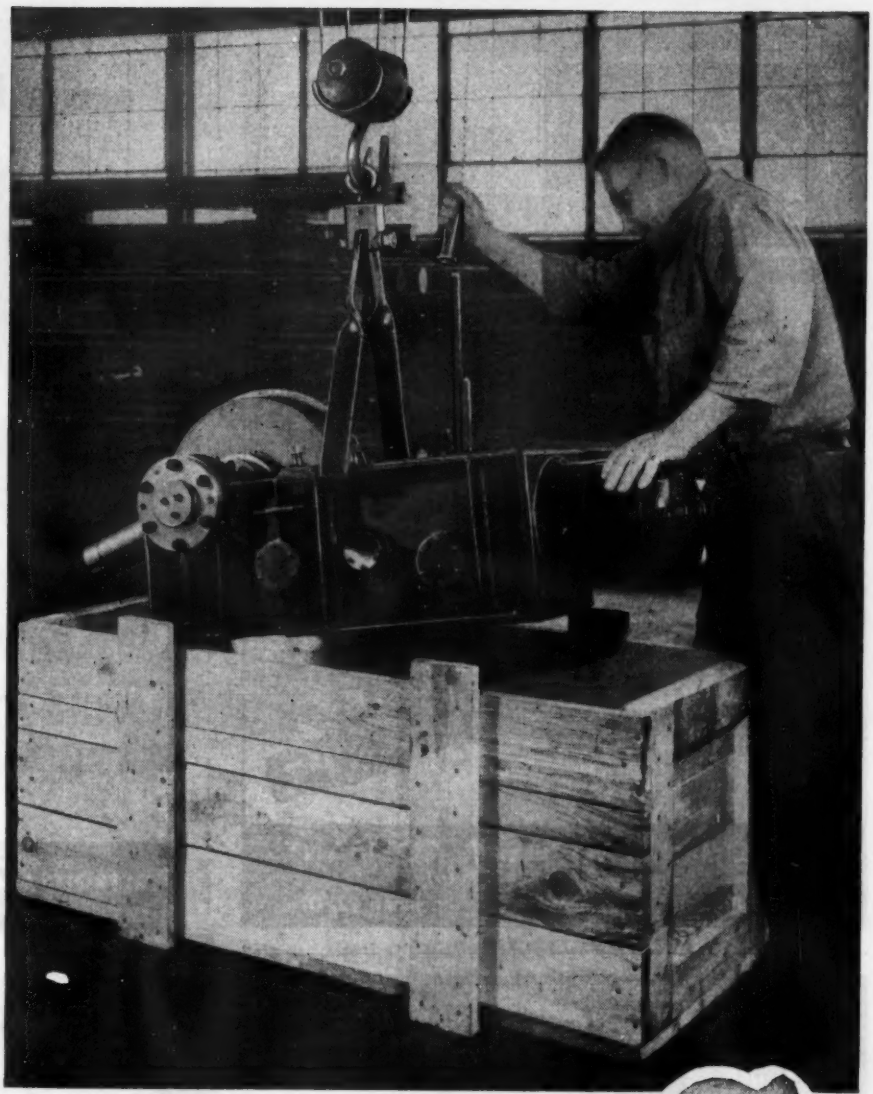
TORIT Dust Collectors
SELF-CONTAINED UNITS

For PRECISION GEARS or... SPECIAL GEAR DRIVEN EQUIPMENT...

...come to SIER-BATH



Sier-Bath's complete, modern facilities for the production of precision gears are also available for the manufacture of transmission equipment in which gears are involved. We are therefore in position to render a valuable service in building special gear-driven equipment including high ratio speed reducers to customer's specifications. The transmission unit shown here is a typical example of the class of work we are prepared to handle.

The scope of gear manufacturing facilities offered by Sier-Bath includes gears of all types from 2" to 52" in diameter. Service is prompt. Ask Sier-Bath to estimate on your specifications for gears or gear-driven equipment.

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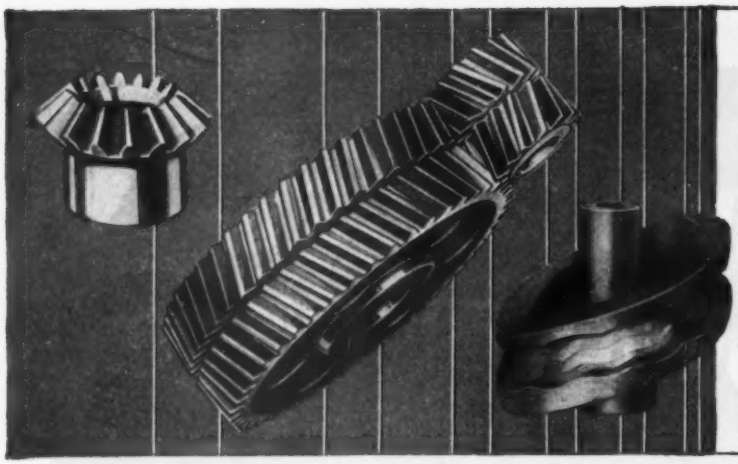
The Doorway to 38 years experience in making Precision Gears



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We of the Cincinnati Gear Company believe our responsibility to industry goes beyond the production of ***Gears, Good Gears Only.*** The ultimate use of these gears is equally important to us.

Putting the *right* gear in the *right* place in the *right* way is not a one-man job. It calls for that combination of skills found only in manufacturer and designer plus materials. Experience proves that this team, working together, leads directly to success in good gear usage.

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- ★ WORM
- ★ SPECIAL

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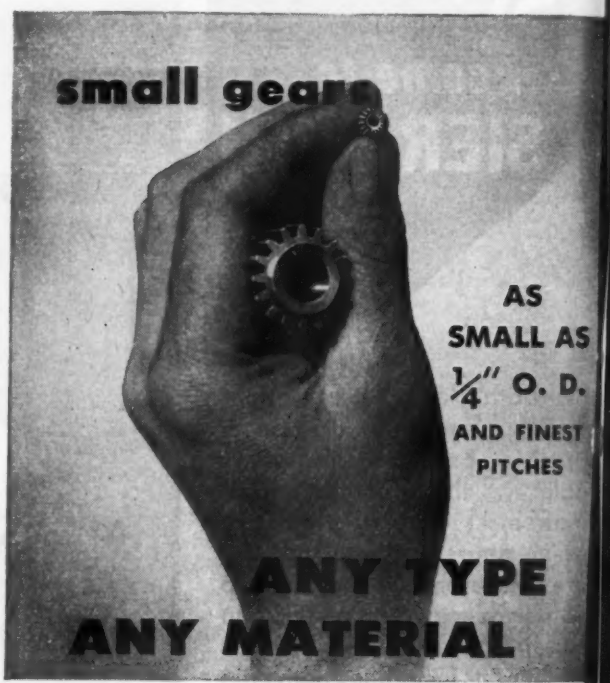

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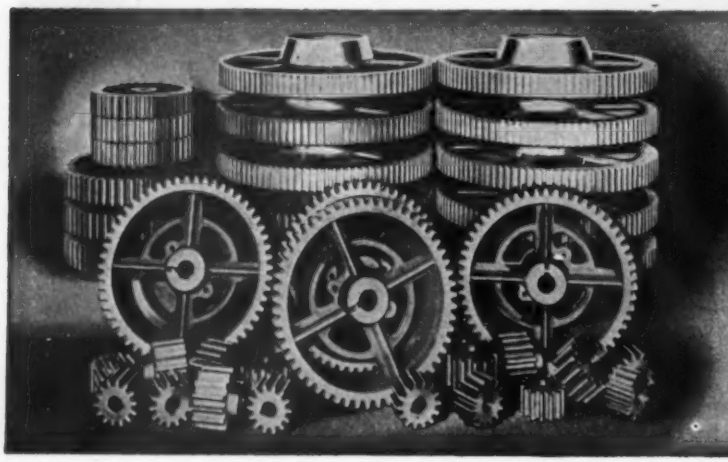

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SPUR — HELICAL — WORM
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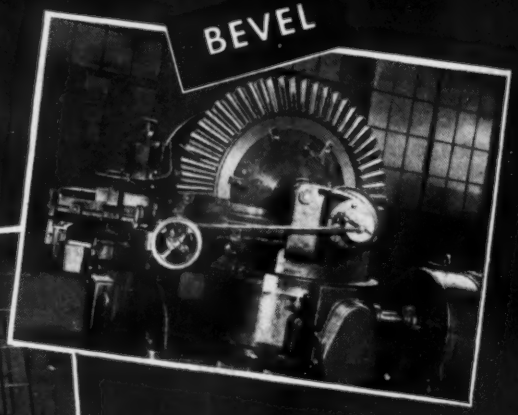
GEARS

ALL TYPES

ALL SIZES



From Philadelphia, you can get practically any type or size of industrial gear that can be made. In addition you can get the benefit of the experience we've gained through specialization for over a half century. This knowledge, with our vast, modern gear manufacturing facilities can be applied advantageously to meet any particular gear problem you may have . . . chances are we have already encountered a similar problem and licked it.

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(14 to 96 D. P.)

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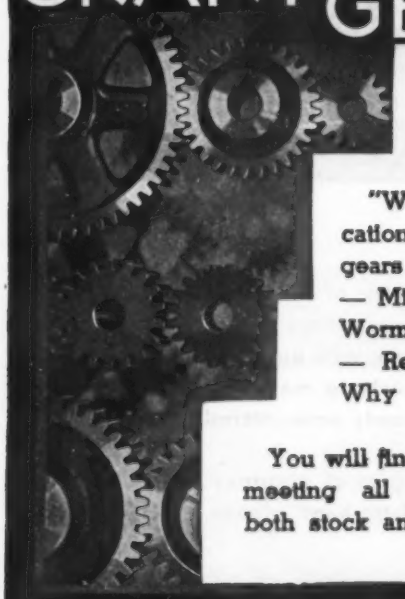
GRANT GEARS



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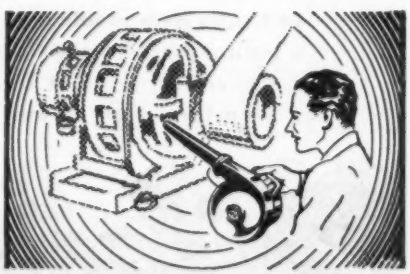

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The "P" in PERKINS always comes first

The fact that both the name, PERKINS and the noun, PRECISION begin with the letter "P", is a significant coincidence. For in the final analysis, Perkins is primarily known for its recognized ability to produce gears of extreme accuracy and high finish to customers' specifications, including the Government's — which means precision to the nth degree.

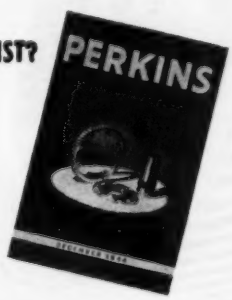
Take advantage of the new techniques developed by Perkins for the mass production of precision, custom-cut gears. Remember that the "P" in Perkins stands for Precision—not to mention Promptness when you require action on gear estimates and gear production.

PERKINS MAKES:

Helical Gears — Bevel Gears — Ratchets
Worm Gears — Spiral Gears — Spur Gears
Ground Thread Worms

* **ARE YOU ON OUR MAILING LIST?**

Perkins is the name of the house-organ we publish monthly; it may be of interest to you. Write us if you care to receive it, P.O. Box 1313. Your good will covers the price of subscription.



PERKINS *Precision Custom-Cut* GEARS

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Why is FALK a good name in industry?

A business institution acquires a fine reputation, not because of its size, not because of the dividends it pays, not because of the patents it holds; but because of the acceptance of its products and methods of doing business by prospects, by customers, and by its employes.

For over fifty years prospective customers for Falk products have been gracious in their acceptance of Falk representatives.

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Falk employes are proud to be associated with the Falk Corporation, and verify their pride by many years of service.

This is evidenced by the Navy's acceptance of Falk products since before World War I; by the attitude of the Falk management toward Falk employes during the lean years of the economic cycle; by the honors bestowed upon Falk officials; by recognition of the high standards of its employe relations accorded by a national magazine; and by interplant and office activities of the employes themselves.

It has long been an axiom of the Falk management that "to build a better product, first improve the man." Falk quality is due in no small measure to the thoroughness of Falk apprenticeship courses.

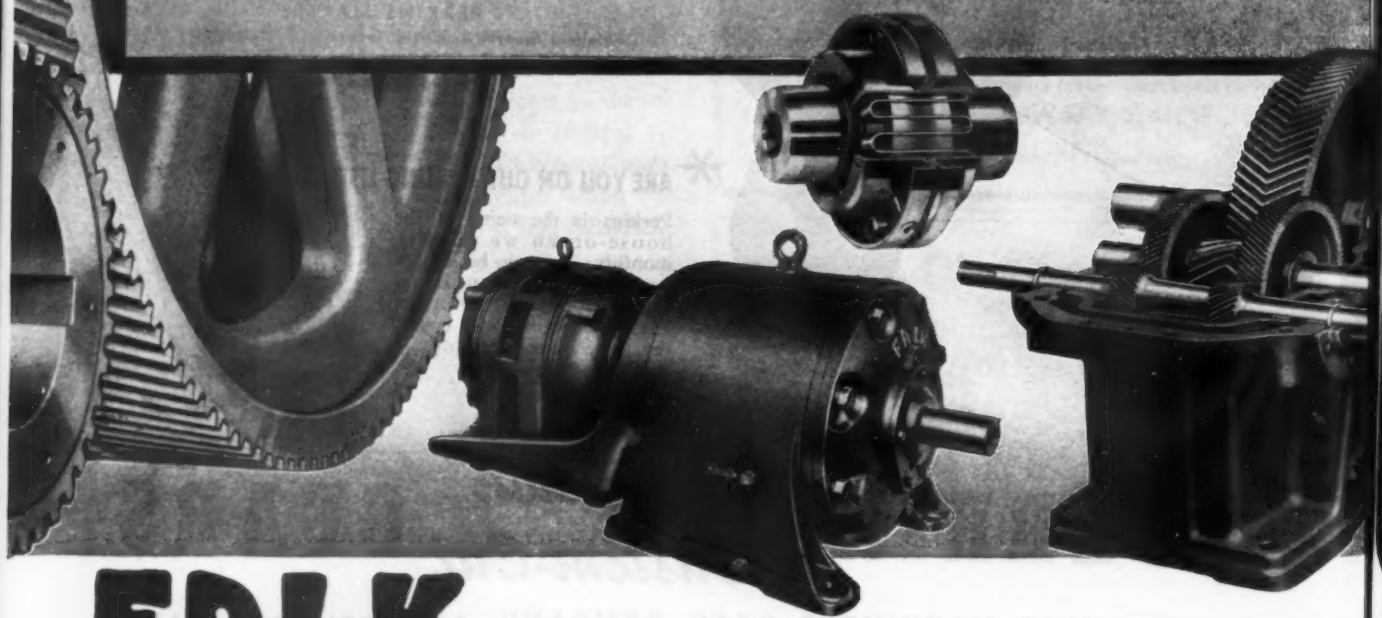
The same thoroughness employed in molding men is employed in molding Falk material. Falk casts its own steel in its own foundry to its own specifications.

To secure the watch-like precision so characteristic of all that Falk produces, it has always been the Falk policy to design its own machinery.

Because Falk has always known its men, its material, and its tools, it logically follows that Falk engineering has always been better than it could have been, had this engineering been done with unknown components.

All of this is just plain good business. No reputation can ever be acquired, much less maintained, unless it is based on plain good business. For plain good business is business that is good first for the customer, then for the employe, then for the corporation—and only then for the management.

This is why Falk is "a good name in industry".



FALK...A GOOD NAME IN INDUSTRY

THE FALK CORPORATION, MILWAUKEE 8 WISCONSIN

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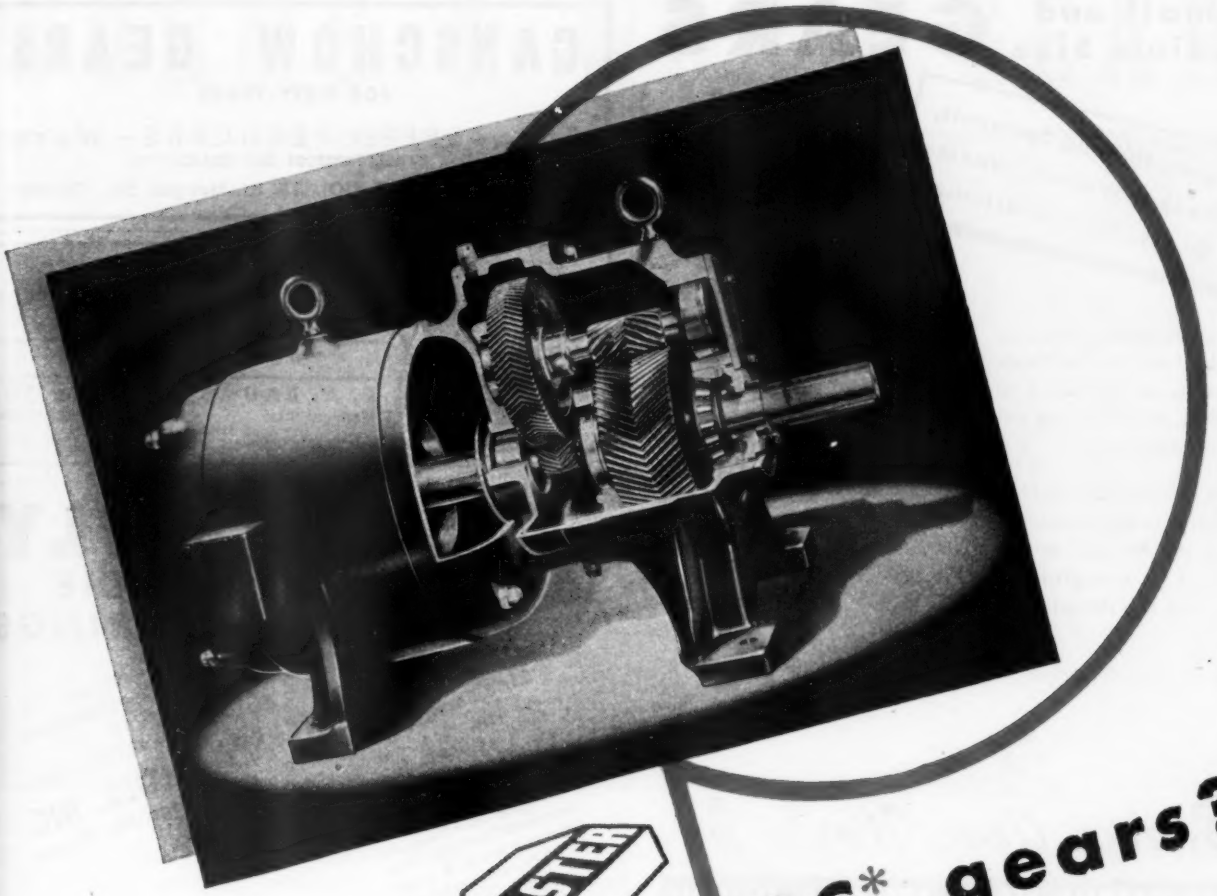

Why does MASTER use these PC* gears?

Because, in the company's own words, they are "quiet, highly efficient and free from chattering."

Smooth, quiet operation, high efficiency and other operating advantages stem from precision manufacture and characteristics of design inherent in continuous tooth herringbone gears of the Sykes type. Overlap or interlacing of the teeth, gradual engagement and inclined line of pressure assure maintenance of correct tooth action throughout the life of the gears, and contribute to continuous operating efficiency and maintenance economy.

Another important factor is the *backbone,* where the two helices meet to form continuous teeth, instead of being separated by a center groove. The entire face width is thus put to work, providing extra strength and high load-carrying capacity in small space—a definite advantage when a compact, light weight, trouble-free drive unit is desired.

The advantages of Farrel-Sykes continuous tooth herringbone gears are available to you, too. You can do as the Master Electric Company does—cut them in your own plant on Farrel-Sykes machines. Or, if you prefer, we can make these gears for you in our Buffalo plant, where we have specialized on gear design and manufacture for a quarter of a century.

* **P**RECISION **C**UT by the famous Farrel-Sykes process of gear generation.

The advantages of Farrel-Sykes Gear Generators for high-speed, economical production of accurate gears are well known to many gear and machinery manufacturers. The versatility, speed, precision and economy of these machines make them a profitable investment. Available in five sizes for generating gears from the smallest practicable minimum to five feet in diameter.

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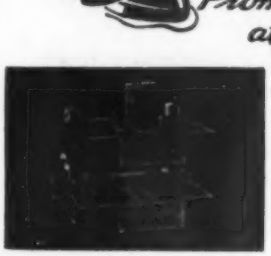

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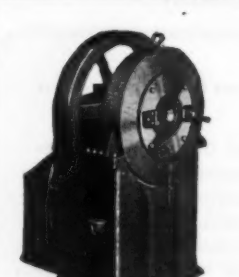

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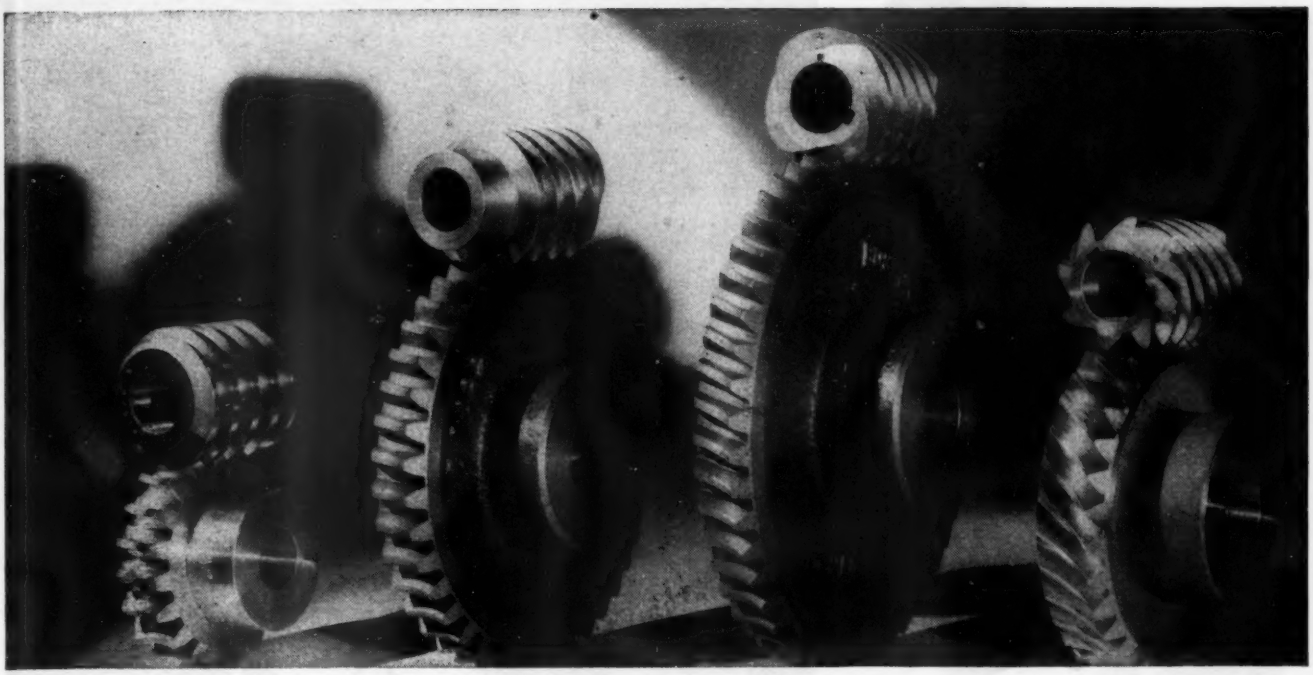
WORMS & WORM GEARS



IN STOCK READY FOR YOUR IMMEDIATE USE, that's the situation with many sizes of Boston Gear Standard worms and worm gears. Boston Gear Standard sizes include steel worms, either soft or hardened with threads ground, and cast iron or bronze worm gears. Further, they include single, double, triple, quadruple and eight thread types in sizes ranging from 3 to 48 diametrical pitch, and in most sizes and types teeth and threads are cut either right-hand or left-hand. Any of the following authorized distributors and direct company branches will be pleased to give you complete specifications and prices of these Boston Gear Standard worms and worm gears.

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Boston Gear Works, Inc. (Branch)
Mau-Sherwood Supply Co.
DALLAS, TEXAS
Geo. J. Fix Co.
DAVENPORT, IOWA
Standard-Bearings Co.
DAYTON, OHIO
Klinger-Dills Co.
DENVER, COLORADO
Denver Equipment Co.
Western Belting & Packing Co.
DES MOINES, IOWA
Standard Bearings Co.
DETROIT, MICHIGAN
Chas. A. Strelinger Co.
EVANSVILLE, INDIANA
Bearings Service Co., Inc.
HARTFORD, CONNECTICUT
Silliter-Holden, Inc.
HIGH POINT, NORTH CAROLINA
Kester Machinery Co.
INDIANAPOLIS, INDIANA
Indianapolis Belting & Supply Co.
Vonnegut Hardware Co.
JACKSONVILLE, FLORIDA
S. B. Hubbard Co.
KANSAS CITY, MISSOURI
Elfedlt Machinery & Supply Co.
LOS ANGELES, CALIFORNIA
Andrews Hardware & Metal Co.
Garrett Supply Co.
LOUISVILLE, KENTUCKY
Industrial Equipment Co.
MEMPHIS, TENNESSEE
Lewis Supply Co.
MIAMI, FLORIDA
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R. C. Duncan Co.
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Keith, Simmons Co., Inc.
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C. S. Mersick & Co.
NEW ORLEANS, LOUISIANA
R. J. Tricon Co.
NEW YORK, NEW YORK
Morris Abrams, Inc.
L. C. Biglow & Co., Inc.
Boston Gear Works, Inc. (Branch)
Bronx Hardware & Supply Co.
NORTH QUINCY, MASS. (Main Office)
Boston Gear Works, Inc.
OAKLAND, CALIFORNIA
C. W. Marwedel
PEORIA, ILLINOIS
Illinois Bearing Co.
PHILADELPHIA, PENNSYLVANIA
Boston Gear Works, Inc. (Branch)
Maddock & Co.
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Somers, Fitler & Todd Co.
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Machine Parts Corp.
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Colcord-Wright Machinery & Supply Co.
ST. PAUL, MINNESOTA
R. C. Duncan Co.
SAN FRANCISCO, CALIFORNIA
C. W. Marwedel
SEATTLE, WASHINGTON
Cragin & Co.
SIOUX CITY, IOWA
Standard Bearings Co.
SOUTH BEND, INDIANA
Bearings Service Co., Inc.
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Boston Gear Works, Inc. (Sls Ofc)
Stacy Supply Co.
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Lenfestey Supply Co.
TOLEDO, OHIO
The Ohio Belting & Transmission Company
TRENTON, NEW JERSEY
Wiley-Hughes Supply Co.
UTICA, NEW YORK
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WATERBURY, CONNECTICUT
White Supply Co.
WINSTON-SALEM, N. CAROLINA
Kester Machinery Co.
WORCESTER, MASSACHUSETTS
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★ ★ ★

CANADA, MONTREAL
Renold Coventry, Ltd.
CANADA, TORONTO
Renold Coventry, Ltd.
CANADA, VANCOUVER
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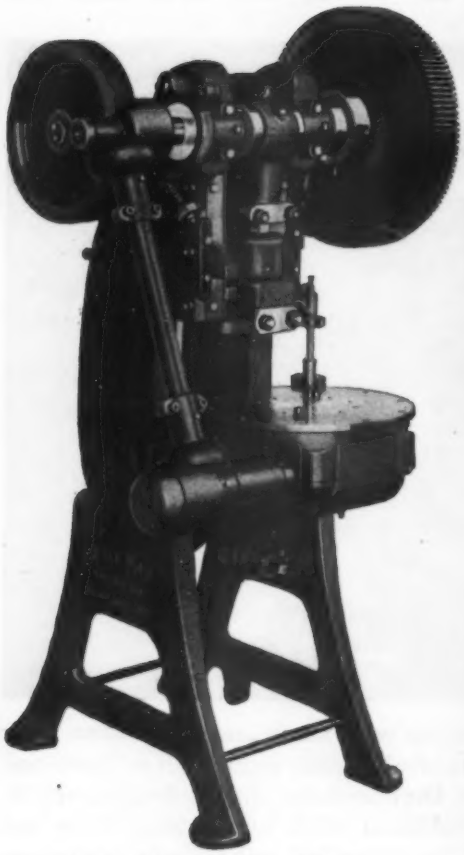
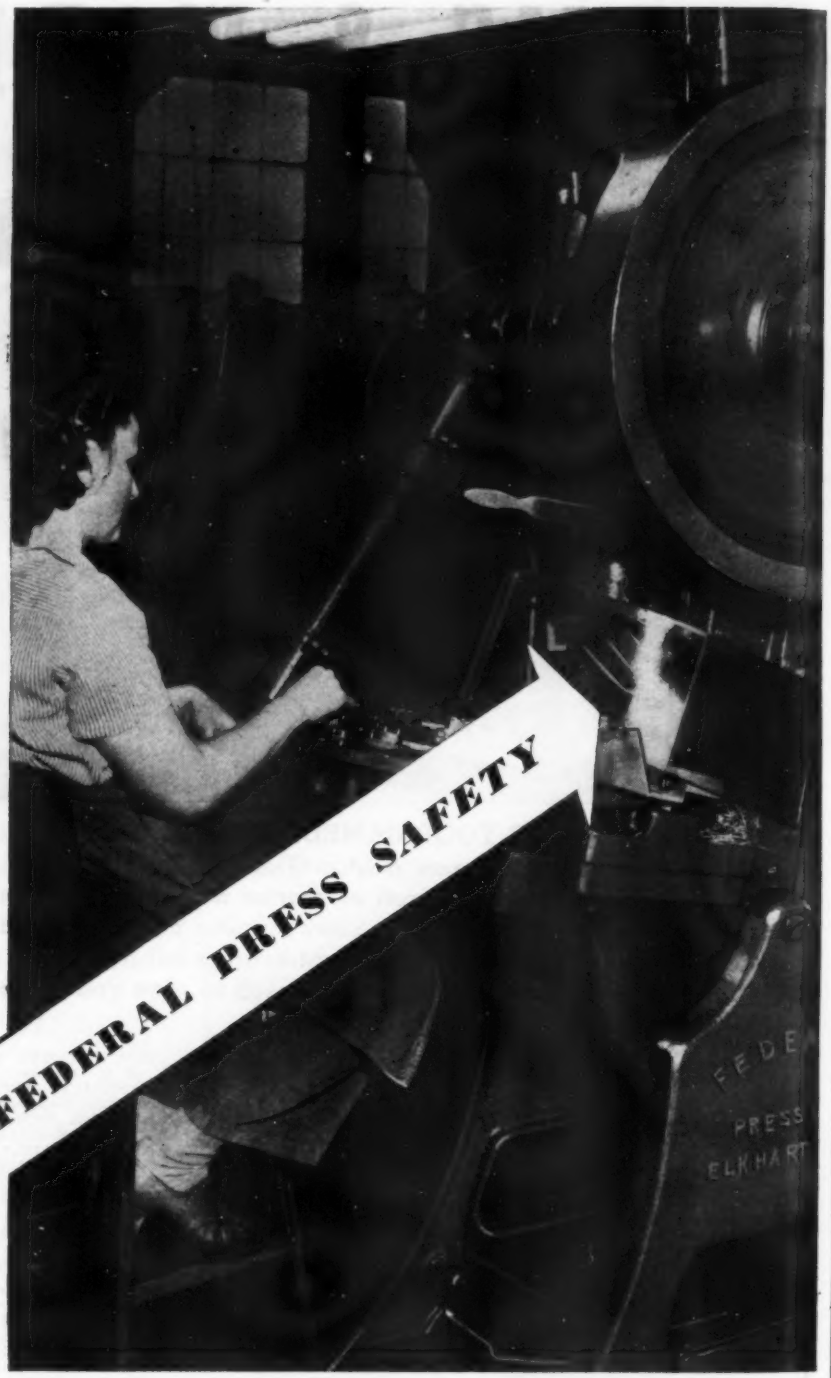
BOSTON GEARS



AVAILABLE IN 8 SIZES—
CAPACITY, 6 TO 80 TONS

Order now—with priority, for war requirements—without priority, for early post-war delivery.



No danger—even with "green" women operators

With so many "green" women operators on the job, production safety is more difficult to control than ever before. Another reason why Federal Dial Feed Presses are so widely used today. Illustration shows one of three in operation constantly at the American Cabinet Hardware Corp. plant. Note operator's position—very convenient for rapid feeding, yet far away from the danger zone.

Yes, Federal Dial Feeds are safe—fast, smooth and precise, too. All moving parts, except the dial plate itself, are fully enclosed—assuring complete safety for the operator, eliminating any confusion, and often increasing production speed as much as 3 to 6 times. A positive locking mechanism smooths out the dial action, permitting unusually high speeds with exceptional accuracy, and assuring additional safety for the operator. Write for latest catalog on the complete line.

FEDERAL DIAL FEED PRESSES

THE FEDERAL PRESS CO. *1103 Division St., Elkhart, Ind. Telephone 2831*

Somebody said "it couldn't be pressed"

THAT is an old story at Mullins where it so often has been proved untrue. It was heard years ago about automobile bodies and fenders, washing machine tubs, motor housings, and wasn't true. It was heard during the war about mortar shells, jettison tanks and bombs, and again wasn't true.

So if you have a product that somebody says can't be made better, lighter, faster and lower in cost on a press, let a Mullins Press Engineer look at your problem.

Manufacturers of
Youngstown Kitchens
by Mullins

DESIGN ENGINEERING SERVICE
LARGE PRESSED METAL PARTS
PORCELAIN ENAMEL PRODUCTS

Until the last shot is fired — buy bonds — give blood — salvage fats and paper — work for Victory. Then do your part to . . .

Mullins
MANUFACTURING CORPORATION
SALEM and WARREN, OHIO

Mullins can PRESS it from METAL instead

War plants are obtaining more production per man-hour with Niagara Power Squaring Shears because of accurate cutting, quick setting, ball bearing, self-measuring parallel back gages, full visibility of cutting line, instant acting Niagara sleeve clutch and other modern features.

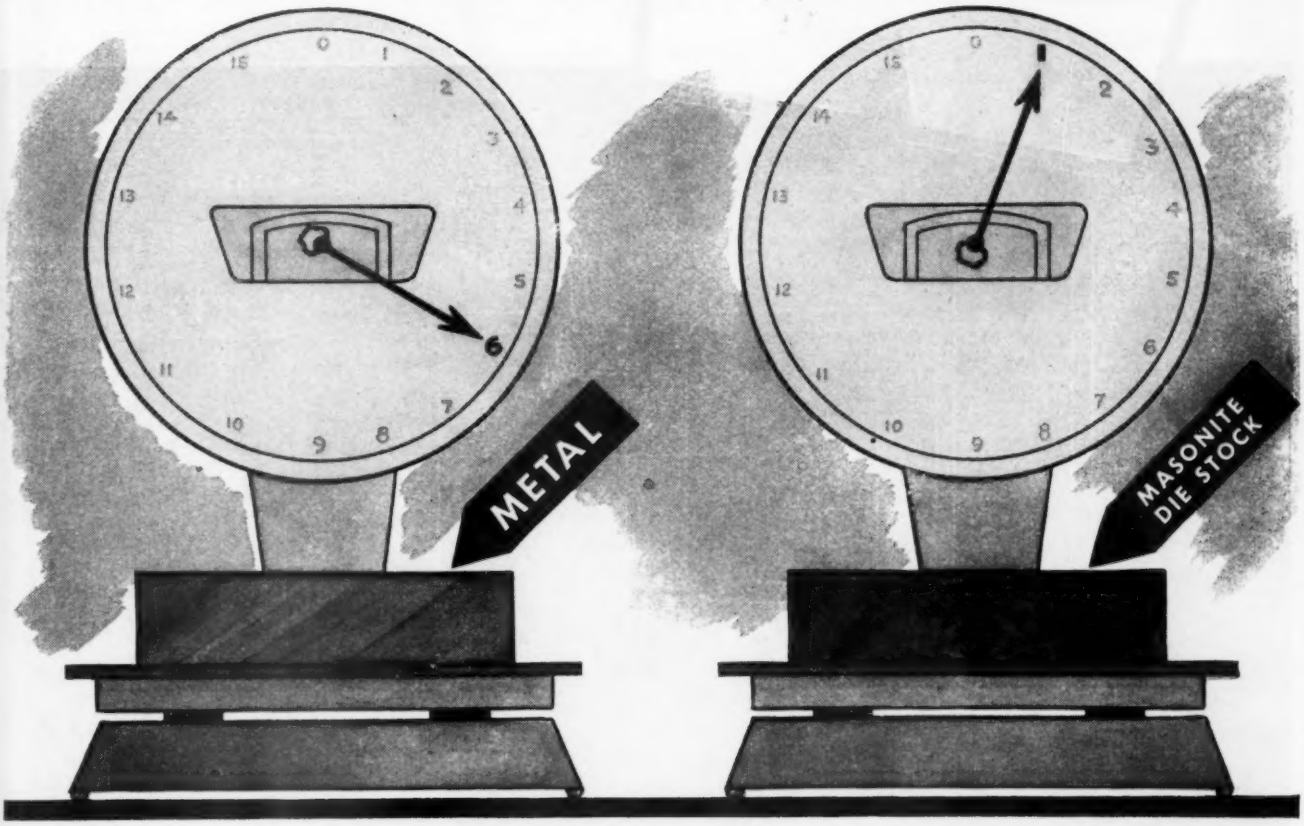
Enclosed drive with gears, clutch and eccentrics running in oil assure long life and low maintenance cost. Four-edge, solid tool steel knives are standard equipment. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

LIGHT-WEIGHT!

MASONITE DIE STOCK HAS 1/6th THE WEIGHT OF METAL!



MEN—and women—who work with Masonite* Die Stock comment on the ease with which this amazing semi-plastic material can be handled. Since it's but one-sixth the weight of metal, Masonite Die Stock creates new economies in time, money and effort.

Possessing inert qualities similar to metal, Masonite Die Stock helps solve problems relating to rigidity, torque, deflection, expansion and contraction. And this smooth, durable material can be worked with either metal-working and cutting tools or with high-speed pattern shop equipment.

Available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For complete details about this modern die stock, please fill out and mail the coupon.

PRODUCTION PIN-UPS. Look for the next issue of "Production Pin-Ups" on your plant bulletin board. They give you pictures and explanations of the latest uses of Masonite Die Stock.

*"Masonite" is a trade-mark registered in U. S. Pat. Off. and signifies that the Masonite Corporation is the source of the product.

MASONITE CORPORATION, Dept. AM-3, 111 W. Washington St., Chicago 2, Illinois.
Please send me complete information about Masonite Die Stock.

AWARDED TO LAUREL, MISS., PLANT

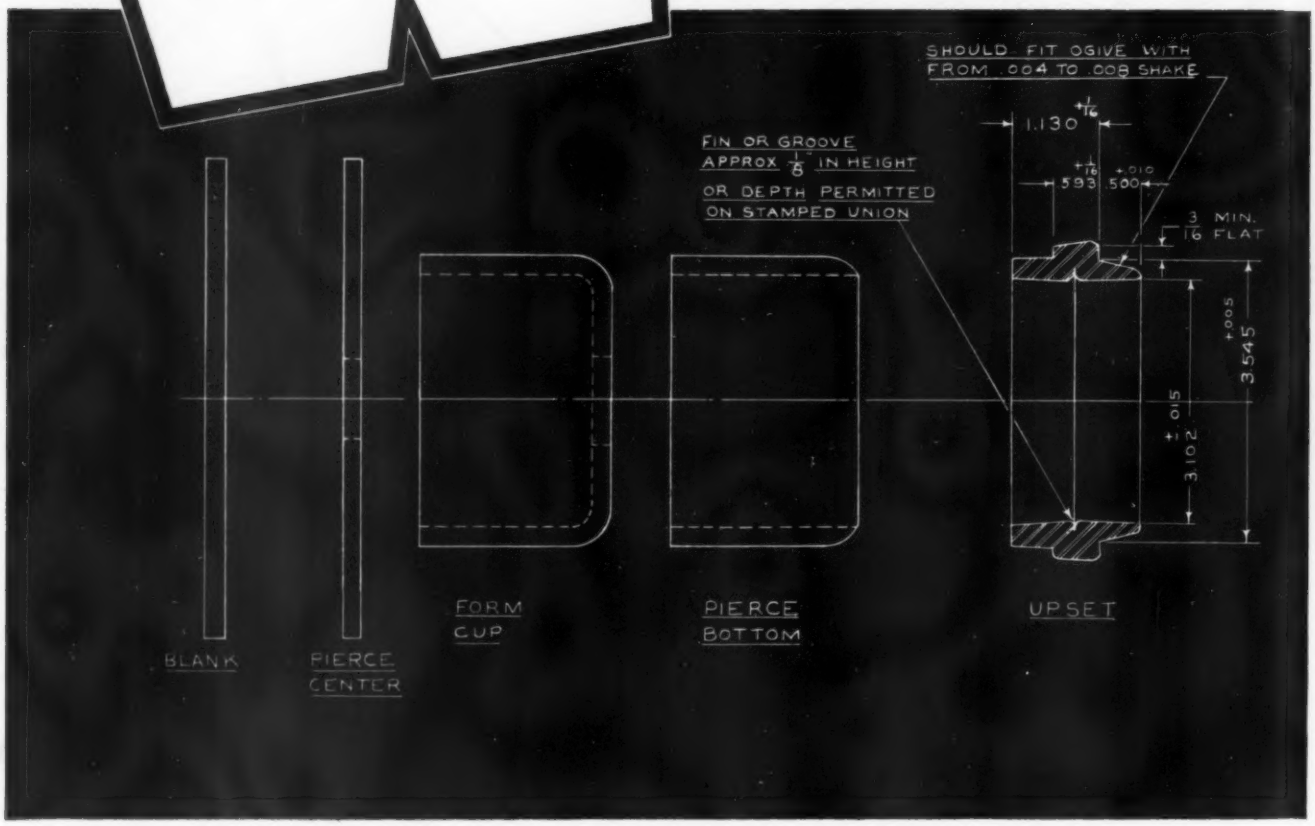
Name and firm .....

Address .....

City ..... *State* .....

BIG PRESTEEL PRESSES

PUSH UP PRODUCTION ON HEAVY STAMPINGS



This adapter union, used at the base of a light shell nose, is formed without the use of a single machine tool.

Starting with a blank ¼" thick and a little more than 6" diameter, only five presses and a furnace are required to turn out 3500 of these adapter unions per day.

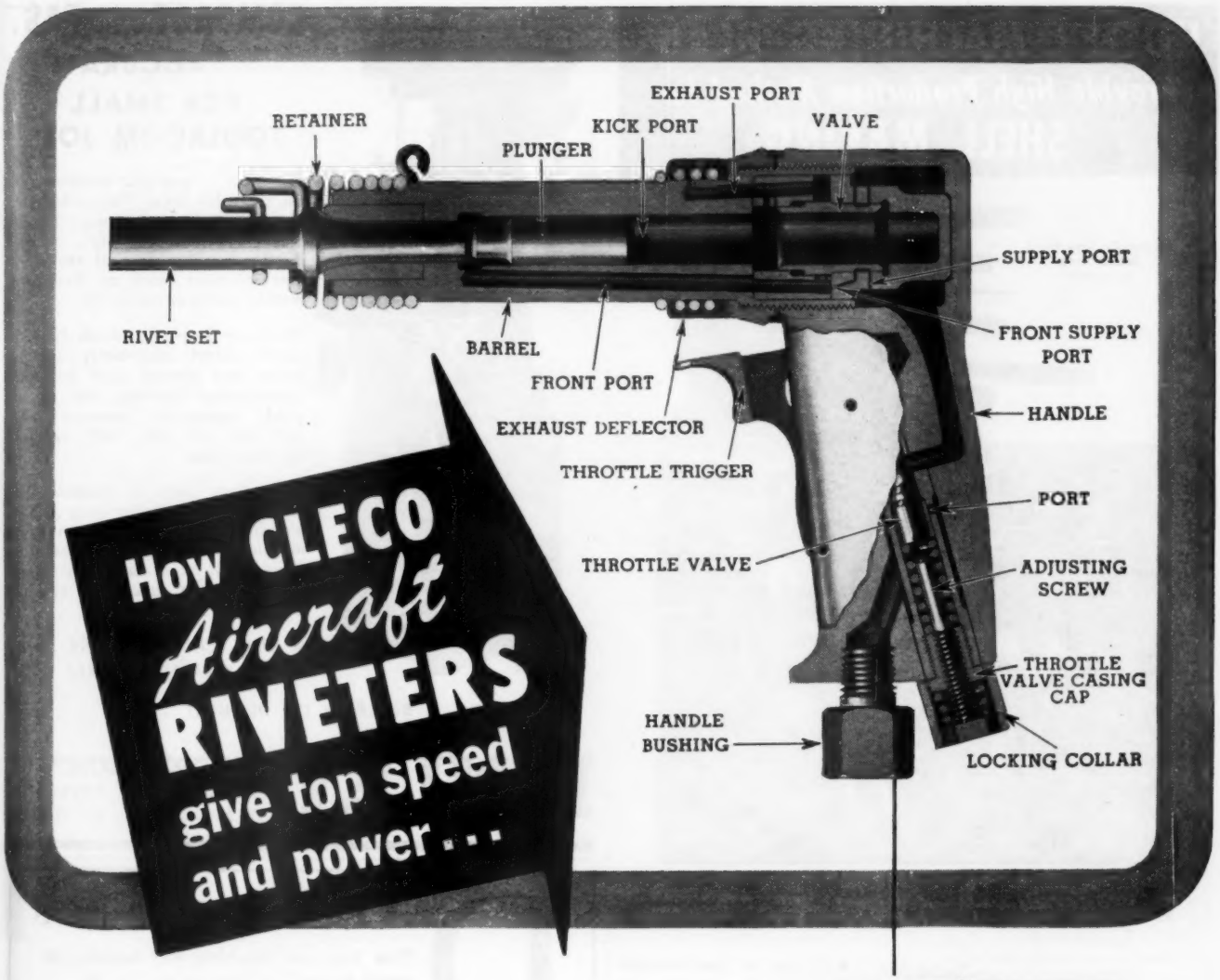
Here is an excellent example of what can be done to boost production when fast large presses are available for heavy stampings.

If you have production problems which heavy, accurate stampings might solve, send us prints or samples. Presteel engineers will be glad to work with you.

WORCESTER PRESSED STEEL CO.

203 BARBER AVENUE, WORCESTER 6, MASS.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883



• Note how precision design features every step in the operation of this Cleco hammer: Air entering the throttle valve, through the supply ports, along the groove of the valve, and through the front supply port forces the plunger to move back from the rivet set. As the plunger returns, it forces air out through the exhaust port until the exhaust channel at the end of the valve is closed by the plunger sliding through the hole in the valve. The valve then shifts toward the rivet set due to air pressure, and air passes through the supply port, across the rear face of the valve, and against the rear of the plunger. As the plunger moves down on its power stroke, exhaust air from in front of the plunger passes from the front port to the exhaust port across the space vacated by the shoulder of the valve when it shifted. Just before the plunger strikes the rivet set, its rear face passes a "kick port." Air pressure entering this "kick port" shifts the valve to the position shown, thus completing the cycle.

Cleco Aircraft Riveters, available in both "slow" and "fast" hitters, with many styles of handles, are fully described in Bulletin 85. Write for it.

SPEED FINAL VICTORY! . . . BUY MORE WAR BONDS

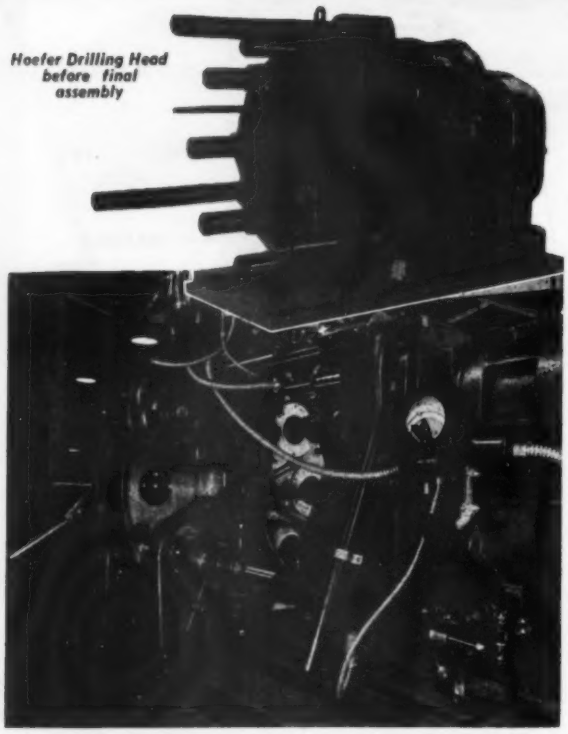
Optional Handle

THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77TH STREET • CLEVELAND 5, OHIO

Branch Offices In All Principal Cities

HOEFER MACHINING HEADS
Provide High Production Method for SHELL MAKING



Hoefer Drilling Head before final assembly

TYPICAL TOOLING FOR 37 M.M. AIRCRAFT SHELL

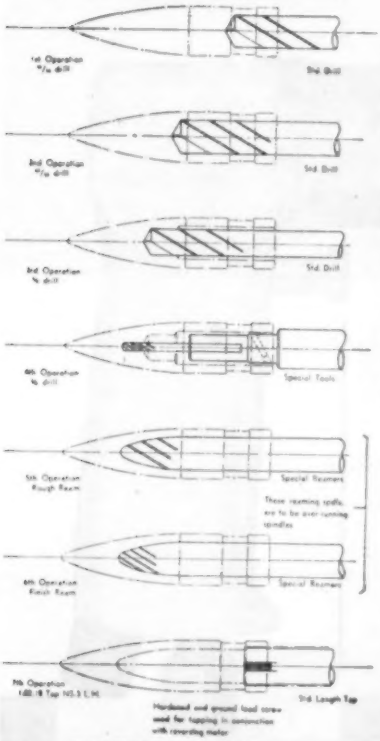


Photo of complete machine showing Hoefer Head at right

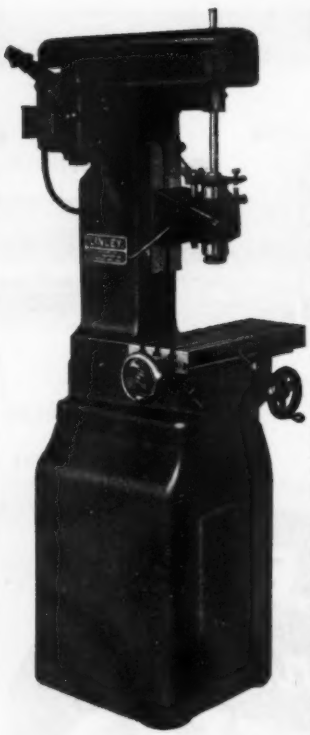
• 37 m. m. anti-aircraft high explosives shells were produced with a Hoefer 15 h. p. unit. A six spindle head was used in connection with an 8 station automatically indexing trunnion, holding 8 pieces, and a single spindle automatically reversing (hardened and ground) lead screw tapping unit. All these were electrically interlocked with a central control station controlling both electrical and hydraulic circuits.

Any such operations ordinarily considered for a multiple turret type machine can be most successfully handled by drilling units in multiple head and electrically indexing fixtures as the above equipment demonstrates.

Confer with us on your problem.

HOEFER'S WHOLE BUSINESS IS HOLES

HOEFER MFG. CO. *Freeport, Ill.*



COMPACT . . . FAST
. . . ACCURATE FOR SMALL TOOLROOM JOBS

The war . . . and your toolroom . . . can't waste heavy "block-busters" on accurate sharpshooting. There's a machine for each duty . . . and the Linley takes care of the small precision work, such as dies, jigs, models, metal patterns, etc.

There are 8 spindle speeds to 4250 r.p.m., direct micrometer setting, velvet feed without quill backlash, grease-sealed bearings, fast set-up, quick changeover, generous table size and only 18½"x20" required for floor space.

Toolmakers' time is valuable. The Linley saves it, helps keep schedules from bogging down, frees larger machines for their rated capacities, turns out a lot of small jobs in remarkably short time. You can use a Linley now and later . . . it's

A LOW COST MACHINE THAT QUICKLY EARNS ITS KEEP.

BULLETIN ON REQUEST

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
The V & O Press Company, Incorporated
HUDSON, NEW YORK

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

First FOR EXTERNAL THREADING . . .

PLAN-O-MILL with *Exclusive* Offset Head

THREE definite advantages are yours when you use Plan-O-Mill's exclusive Offset Head for external thread milling.

1. Lower cutter cost.
2. Longer cutter life.
3. Better cutting control.

With Plan-O-Mill's exclusive Offset Head you can use a small, solid, low-cost cutter to mill external threads over 1½" in diameter. Shown above is a typical application.

Plan-O-Mill is a high production machine for internal and external threading and form milling. It is fast, accurate and economical, producing work of exceptional finish. General Electric Thy-motrol gives separate and complete control of feed-in and feed-around—enables one operator to handle two or more machines.

For war or postwar production, turn now to Plan-O-Milling. Ask your machinery dealer for details or write direct.

Five Firsts

1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-CO MILLING CUTTERS

PROVING Ground for

CLEVELANDS' Cost Cutting

IN this fully equipped "automatic department" of the Cleveland Automatic Machine Company's plant, claims are proved before they are made.

Production estimates, which are important features of Cleveland Automatic proposals are all based upon careful figuring involving the cumulative experience of a staff of production experts. BUT . . .

Unless the estimated time and cost savings are obviously certain to work out in practice they are PROVED on the proposed machine before being released to a prospective customer. YOUR JOB is set up, tried, torn down and set up again, until the BEST way to produce it at LOWEST COST is worked out. Actual production experience with our own machines is the foundation for our oft repeated theme . . .

Just Remember . . . Clevelands Cut Costs

CHICAGO (6):
1408A Civic Opera Building
DETROIT (2):
540A New Center Building
NEWARK (4):
902A American Insurance Bldg.
CINCINNATI (12):
4932A Beech Street
HARTFORD (1):
529A Capitol National Bank Bldg.

THE CLEVELAND AUTOMATIC MACHINE CO.

IN BATTLE PLANNING . . .

OR PRODUCTION PLANNING . . .

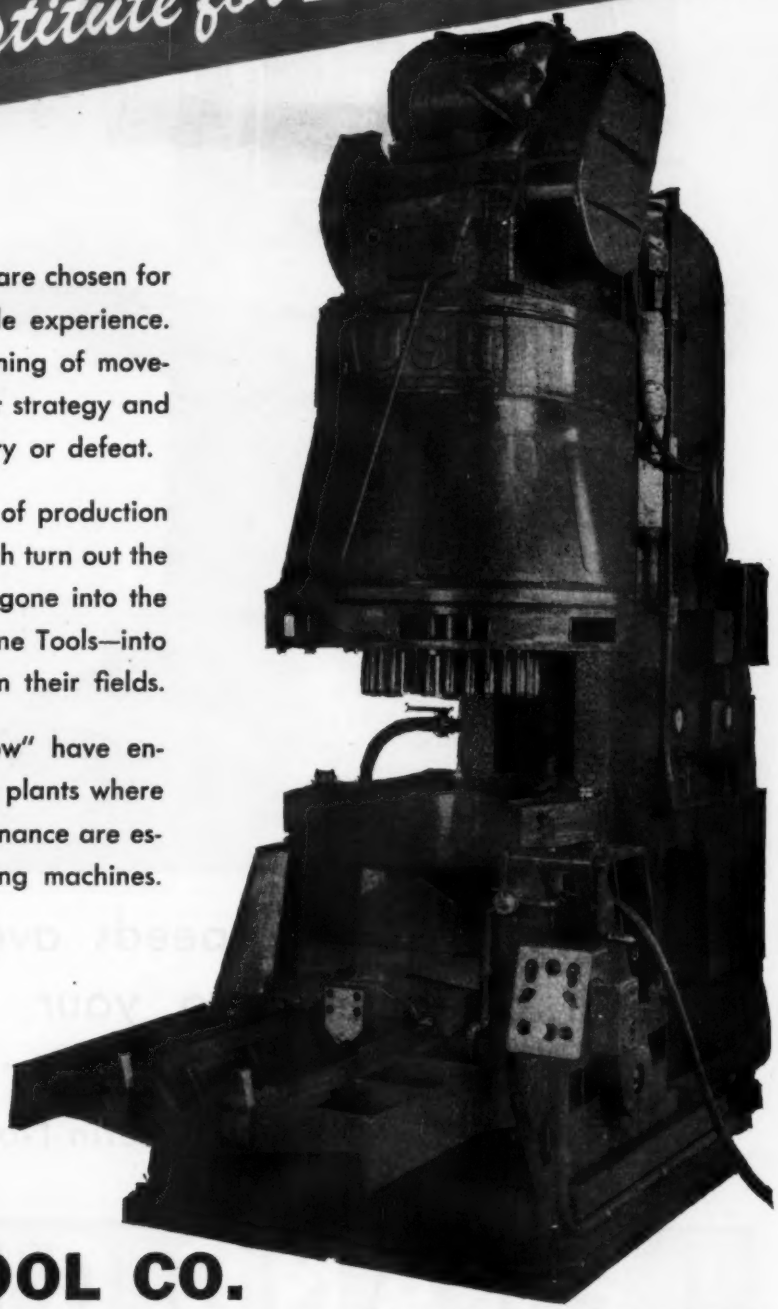
There is No Substitute for EXPERIENCE!

The commanders of our Armed Forces are chosen for their skill gained through actual battle experience. On them depends the important planning of movements of troops and supplies. On their strategy and experienced leadership depends victory or defeat.

Likewise on the home front the battle of production is dependent on the machine tools which turn out the work. Fifty years of experience have gone into the planning and building of Baush Machine Tools—into producing products that are leaders in their fields.

Constant improvement and "know how" have enabled us to lick production problems in plants where endurance, speed and minimum maintenance are essential for multiple drilling and tapping machines.

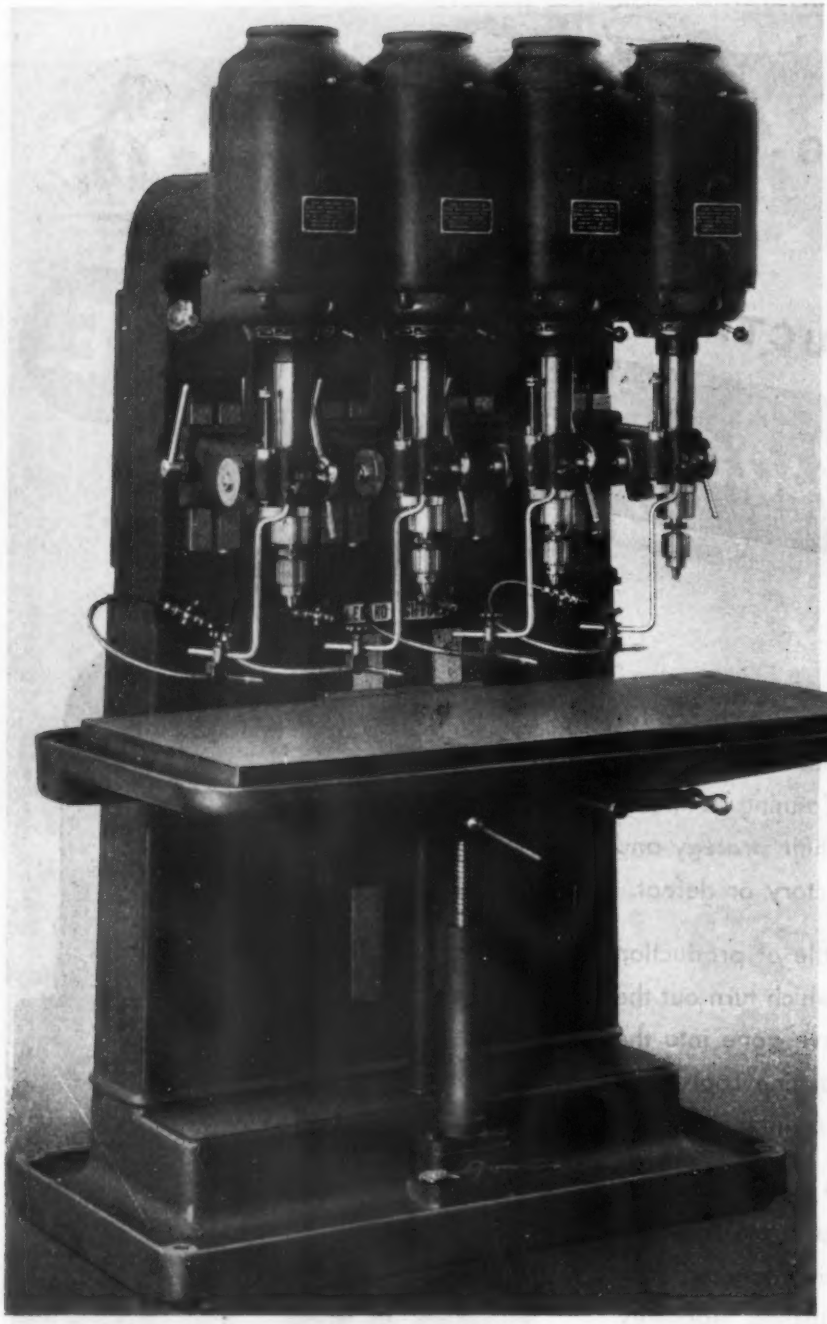
Write for descriptive literature on Baush Machine Tools.



BAUSH MACHINE TOOL CO.

SPRINGFIELD, MASS. DETROIT, MICH.

Baush Vertical W-7 Hydraulic Multiple Spindle Drill 2-speed geared yoke—32" round head furnished with 38-1½" diam. spindles with nose adjustment. Operation: Drill 26 holes 11/32" diam. and 12 holes 7/32" diam. in support rear cam.



This

LELAND GIFFORD

Number One LMS DRILLING MACHINE

is sensitive enough to drill No. 80 holes on a production basis, but is no toy.

The four speed motor has power to drill 5/16" holes in steel, and the eight speeds available in this machine make it a godsend to your overburdened production department. Bench or Floor Type. 1 to 6 Spindles.

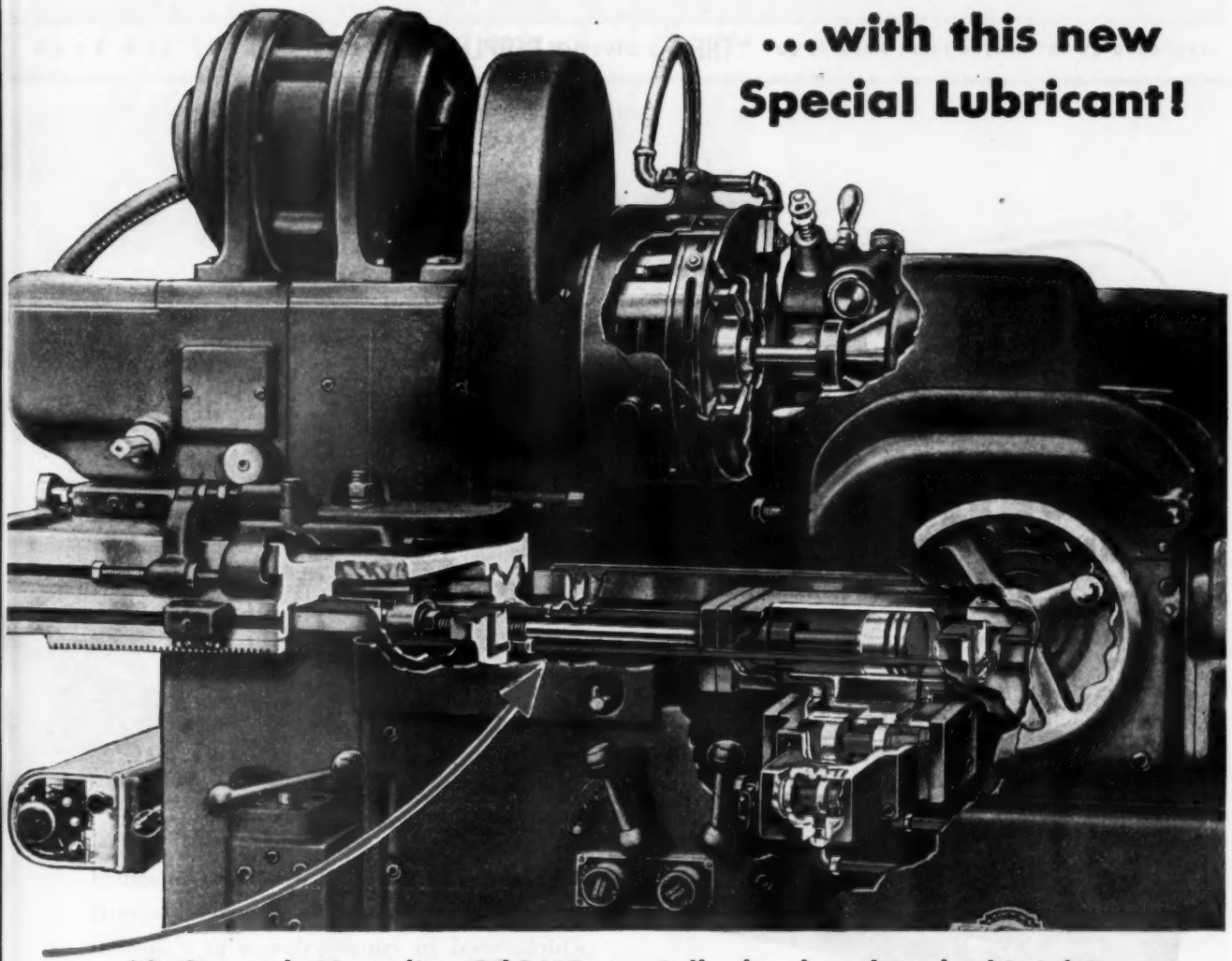
Ask for Bulletin No. 400A.

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

RELIEVE TABLE JUMP

...with this new Special Lubricant!



It's Gargoyle Vacuoline Oil 1409, specially developed to do this job!

ON PRECISION grinders like this, where the ways are lubricated from the hydraulic system, you need a special oil designed for the combination job.

For in the hydraulic system, the oil must resist the formation of gum and other deposits that cause trouble in the valves and pump. And on the ways it must form thin, yet extremely strong films that reduce frictional resistance, resist rupture and relieve table jumping, providing smooth, even operation.

Working closely with machine builders and operators, Socony-Vacuum has developed a special oil that possesses this combination of characteristics. It's Gargoyle Vacuoline Oil 1409.

This new oil already has proved its superiority in this kind of service and has the approval of leading machine builders. Operators who are using it, report smooth, chatter-free response to valve controls with increased production of accurately and highly finished parts. Get full details from your Socony-Vacuum representative.

SOCONY-VACUUM OIL CO., INC.
Standard Oil of N.Y. Div. · White Star Div. · Lubrite Div. · Chicago Div. · White Eagle Div. · Wadhams Div. · Magnolia Petroleum Co. · General Petroleum Corporation of California.

CALL IN SOCONY-VACUUM FOR "CORRECT LUBRICATION"

GARGOYLE
Lubricants

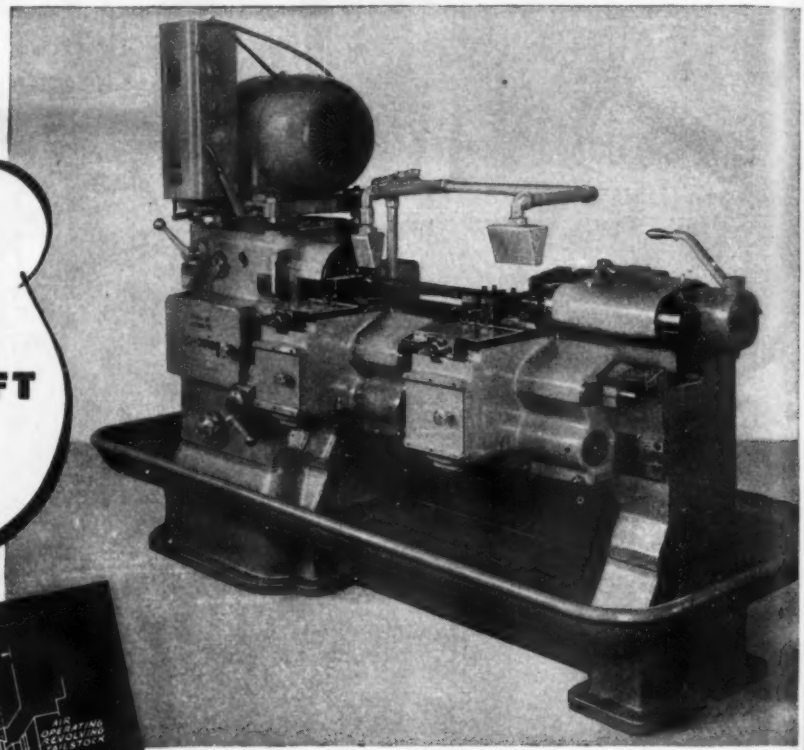
Socony-Vacuum's FIVE STEPS to Lower Production Costs for You

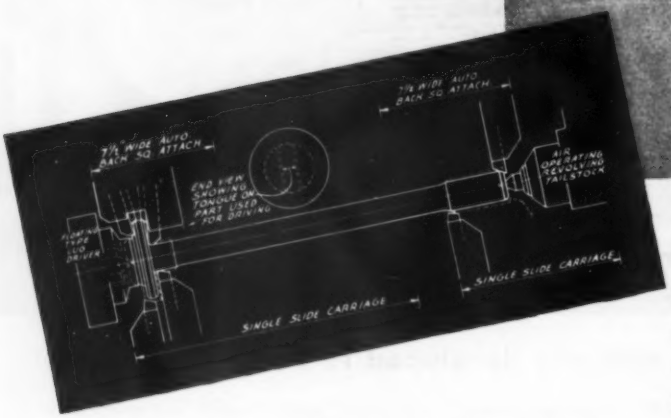
1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
3. Lubricant Storage and Handling System
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

MODEL "LR" *Lo-swing* TURNS AXLE SHAFT COMPLETE IN ONE OPERATION




7½" WIDE AUTO. BACK SQ. ATTACH.
END VIEW SHOWING TONGUE ON PART USED FOR DRIVING
AIR OPERATING REVOLVING TAILSTOCK
SINGLE SLIDE CARRIAGE
SINGLE SLIDE CARRIAGE

Problem: To provide a standard Automatic Lathe for turning both ends of automotive axles in one operation, using cemented carbide tools and fast cutting speeds.

Solution: The Model "LR" Lo-swing Lathe selected for this job was equipped with two independently operated front carriages and two rear facing attachments. All tool slides operate simultaneously, as shown in the line drawing, making for fast machine cycle.

The forging dies used for forming the flanged end of the shaft were first modified to obtain a driving tongue (shown on layout) which, used in conjunction with a special driver, will clear the tooling used for finish turning the different surfaces on the large flange.

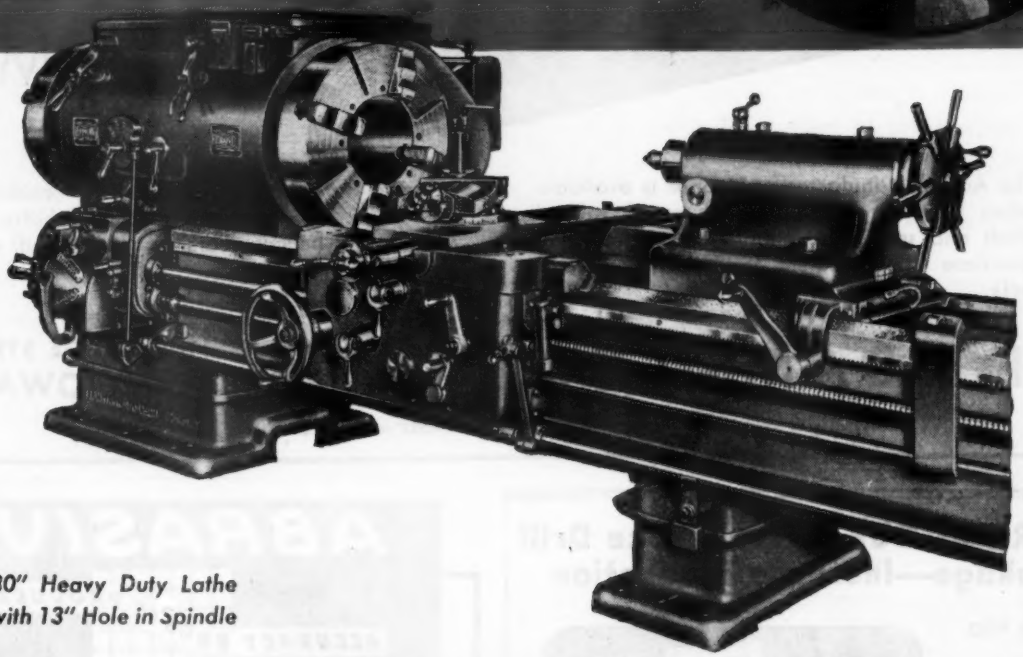
The Model "LR" Lo-swing carriages are equipped with the Seneca Falls Quick Change-over mechanism. Change-over from one type of axle shaft to another is easily and quickly accomplished by setting two calibrated dials to the proper position, thus eliminating entirely the necessity for designing any special cams or tooling.

Our engineers are at your disposal for assistance with any of your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

We Won't Get Faster Production Until We Get a Hydratrol Lathe



30" Heavy Duty Lathe with 13" Hole in spindle

Hydratrol Lathes

LARGE HOLLOW SPINDLE TYPE

For Faster Production...Better Work...Lower Costs!

Look around your own shop—you may find a number of machining jobs which could possibly be done better on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a time-and-money-saving recommendation.

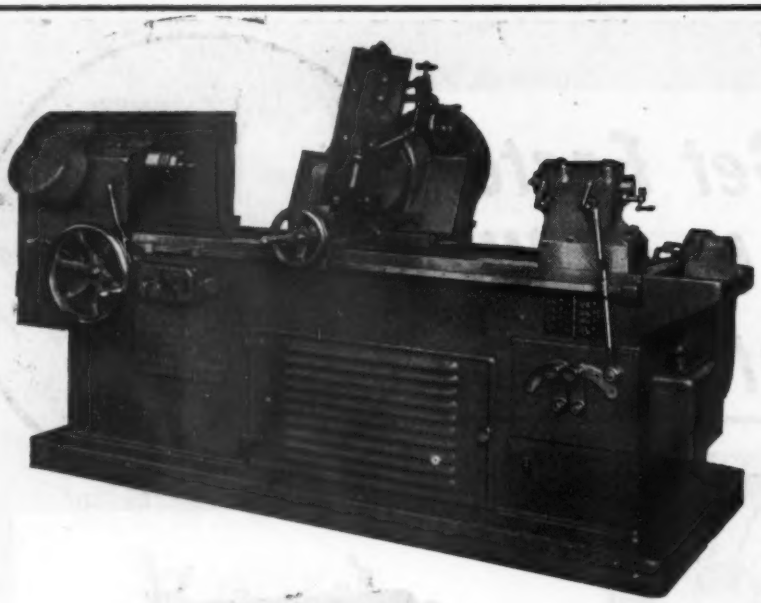
5 Sizes-18" to 36"

Small.....18" up to 7¼" Hole
Medium.....24" up to 12" Hole
Large.....27" up to 13" Hole
Large.....30" up to 14" Hole
Large.....36" up to 16½" Hole

(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND • • • ST. LOUIS 3, MISSOURI



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY

1905 BRIDGE STREET
DUBUQUE, IOWA, U.S.A.

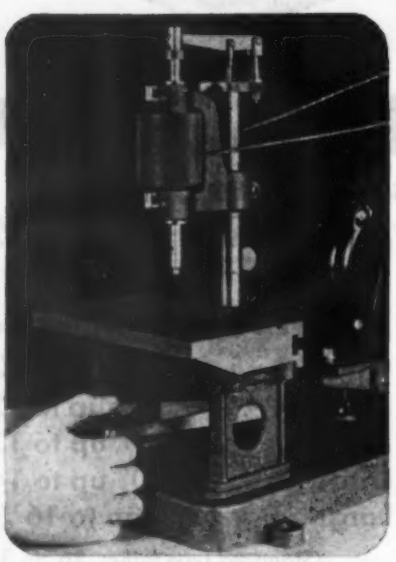
1883 — Our 62nd Year — 1945

ASSURE ACCURACY—Reduce Drill Breakage—Increase Production

with the

Lord & Davis

Super-Sensitive
HIGH-SPEED
DRILL PRESS



Eight spindle speeds from 3000 to 23,000 R.P.M. are available on this machine which is made in 1, 2, 3, or 4-spindle models.

Designed for using drills from .004" to 1/16", it is of precision, balanced construction. It is unusually sensitive, thereby increasing production and minimizing drill breakage.

Convenient, finger-tip control is provided, the feed lever being linked to top of precision spindle through spindle mount. The weight of this feed mechanism is counter-balanced by a long spring inside the mount.

Maximum feed 1¼"—Table 4⅞"x8"

Write today for Descriptive Bulletin, giving complete details.

MASSASOIT MACHINE CO.
220 GROVE ST., WALTHAM 54, MASS.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

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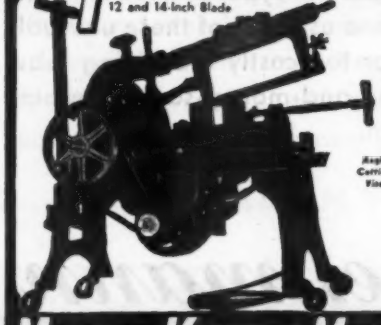
ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

POWER HACK SAW ★

12 and 14-Inch Blade



LOW PRICED
•
PORTABLE
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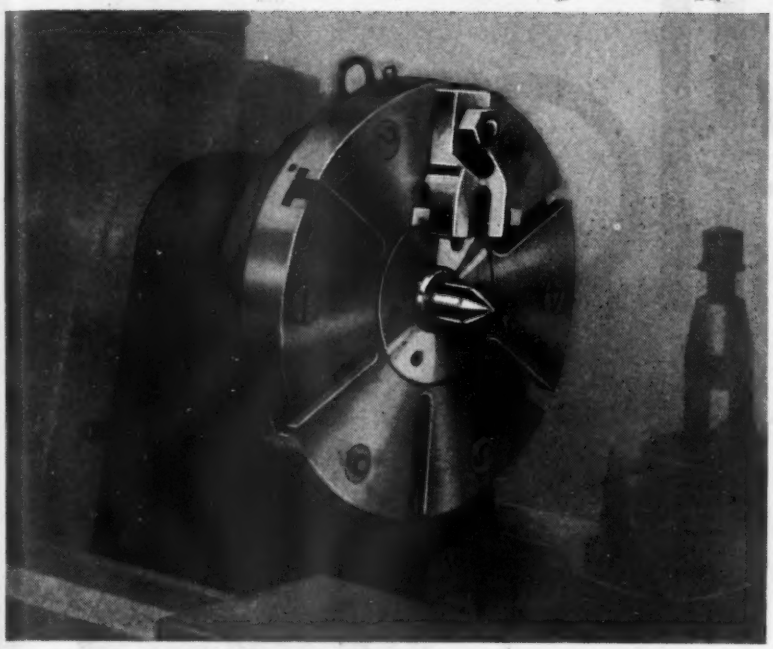
READY TO WORK
STURDY
ECONOMICAL
Write for Bulletin No. 100

MILLER-KNUTH MFG. CO. OMAHA, NEB.



An example in the use of Sub-headstock. If the gear box handles are set for the coarsest lead shown on the index plate of an 18" Hendey lathe, i.e., 1", then for six turns of the main spindle the carriage will have advanced 6-inches; while the driving plate of Sub-headstock will have revolved but one turn. This means a lead of 6-inches to one turn of work has been obtained.

Hendey

SUB-HEADSTOCK

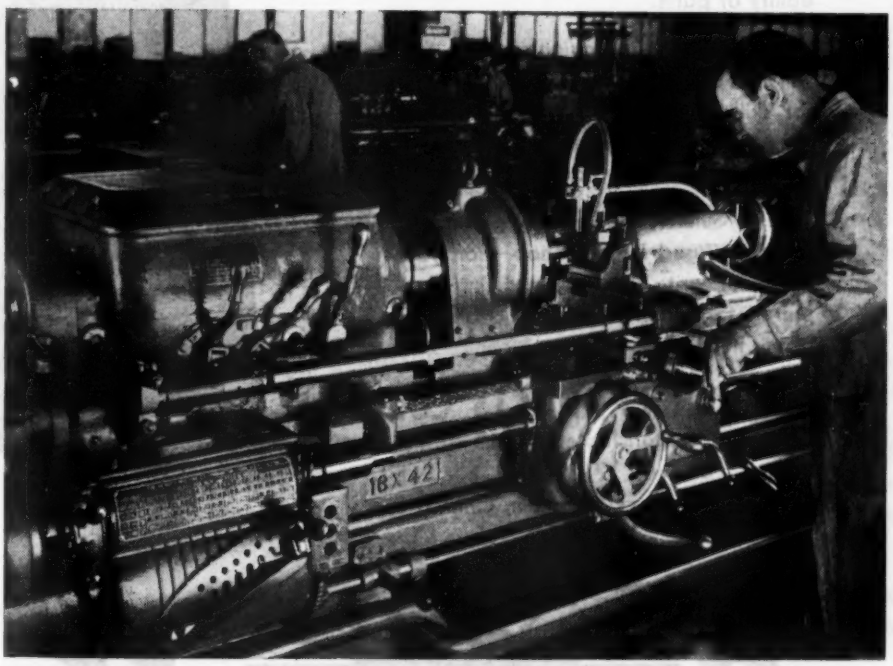
Is a gear reduction unit complete with driving plate and dead center, designed to give slow work speeds in the ratio of one turn of driving plate to six turns of lathe spindle.

The Sub-headstock is fitted to the bed directly in front of the headstock proper, and is driven through a gear mounted on nose of main spindle.

SOME OF THE ADVANTAGES OF THE SUB-HEADSTOCK ARE:

Chasing of screw threads having exceptionally long leads;
Turning and relieving with wide forming cutters. (In this case using the Hendey Relieving Attachment.)
Turning and relieving hobs with long leads.
Relieving milling cutters with large numbers of teeth.
Turning work on dead centers.

A coordinated job of relieving, using the Sub-headstock with the relieving attachment to secure required work speeds.



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75 years employed in the manufacturing of machine tools demanded by critical users who have always wanted the best.

1945

THE HENDEY MACHINE CO.

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Precision HONING

of diameters from .185" to 2.625" with a guaranteed accuracy of .0001"

With the Sunnen Precision Honing Machine you can hone and finish any internal cylindrical surface in any metal or plastic except lead or babbitt. Holes are straight and round and the surfaces produced are super-smooth—often from 2 to 3 micro-inches. This means longer life of parts, fewer rejects, and greater interchangeability of parts.

Here is a real precision machine that will increase production without the need for skilled labor. Any mechanically inclined worker can learn to turn out precision work in a few hours' time.

Let a Sunnen engineer show you how it can be used in your shop—on your jobs—or write for bulletin giving complete information on all the advantages of this machine.

SUNNEN PRODUCTS CO.
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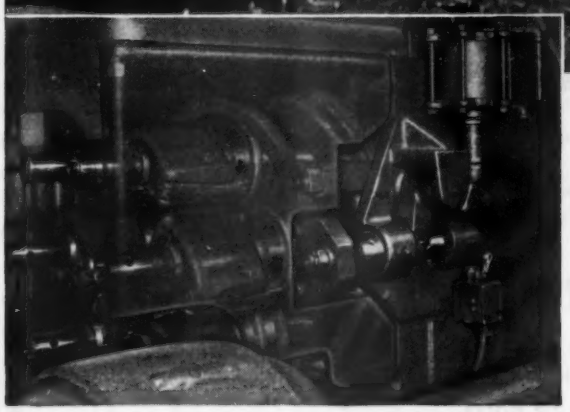
SUNNEN HONING

Speed • Accuracy • Finish

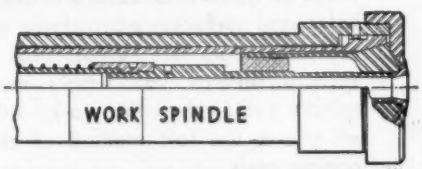
A STANDARD BAR MACHINE WITH

A Dual Personality



AIR OPERATED COLLET MECHANISM

View shows air cylinder and collet operating mechanism used on Greenlee Six with hand chucking equipment. Parts are loaded while machine is in feed stroke. Safety stops prevent indexing until chucking operation is completed and collet is closed by air valve.



PARTS ARE EJECTED AUTOMATICALLY

By means of the hand operated chucking spindle, the work piece is loaded into the work spindle at No. 2 position against the tension of the spring loaded ejector. Piece is processed quickly at five stations. When completed, operator opens collet and piece is ejected. Coolant passes through spindles and clears chips.

CHUCKING EQUIPMENT ARRANGED FOR QUICK CONVERSION ON A GREENLEE SIX-SPINDLE AUTOMATIC

Yesterday, this machine was set up as a standard 6-spindle automatic and capably produced thousands of precision parts from bar stock. But, today, *it's a Chucker,* and its six spindles are humming a production tune on secondary operations. Overnight, between sunset and sunrise, it was converted to meet the ever changing requirements of war.

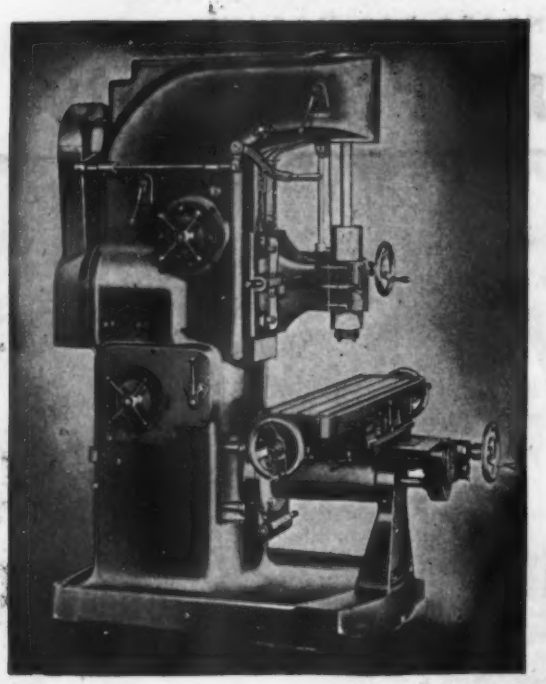
It is this kind of versatility that helps keep Greenlee Automatics in the production picture day in and day out. It is their quick change-over features that facilitate fast handling of an unusual variety of both short and long run jobs. They are designed to handle a wide range of requirements for the job shop and the mass producer alike. Yes, in more ways than one, the Greenlee has a *"dual personality".*

If you haven't checked up lately on the Greenlee Six, it'll pay you to do so today. *Write for more facts.*

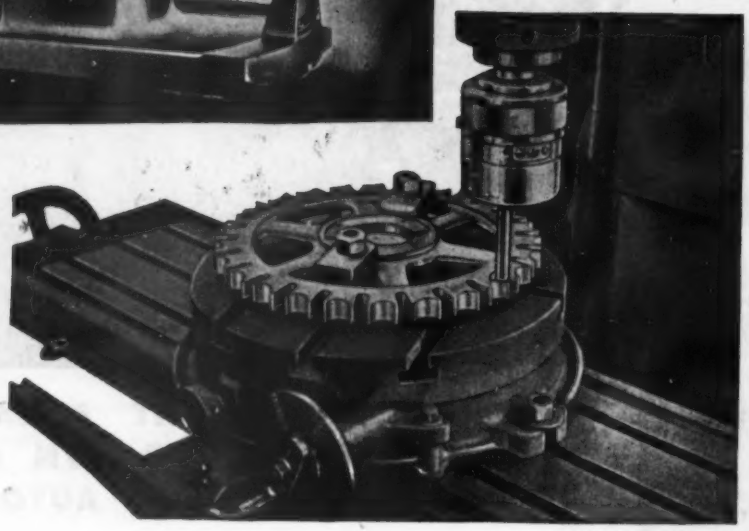
GREENLEE BROS. & CO.
1723 MASON AVE., ROCKFORD, ILLINOIS

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



THE VERSATILE ALL-PURPOSE KNIGHT Miller EQUIPS YOU FOR UNUSUAL CAPACITY



You get that all important "ACCURACY"

The geneva cam in this picture illustrates a typical job requiring accurate milling, boring, and spacing. The slots between the cam tracks held to be the same width and depth, the cam tracks all the same radius, and the spacing from center to center of each exactly the same. This was done quickly as well as accurately on a KNIGHT Miller equipped with indexing rotary table.

- ★ Speed and Accuracy for light milling
- ★ Power and Rigidity for heavy cuts
- ★ Difficult and Unusual Parts handled quickly and accurately without special equipment
- ★ Limited and Special Production done economically and quality maintained without special tooling
- ★ Internal and External Milling done at one setting

● The KNIGHT Miller's wide range of spindle feeds, solid table unit, ease of handling combine with other features to give you unusual capacity whether for light milling, heavy milling, or precision boring.

These milling machines will perform and produce at any of their speeds and feeds to the full capacity of the motor installed.

Capacity too is realized because of the short time necessary for making set-ups even though they are difficult ones. Additional setups in most cases are eliminated — some are greatly simplified.

There is quick and accurate location of holes and surfaces—particularly so when dial indicators are used. To change vertical settings you simply move the spindle rather than the work. Added to all this is the fast method of changing cutting tools.

To get the full story on the fast, compact, complete, and convenient-to-handle KNIGHT Miller, write for catalog.

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

IMMEDIATE DELIVERY SUBJECT TO PRIOR ORDER

W. B. KNIGHT MACHINERY CO.
● ST. LOUIS, MISSOURI ●

It Can't Happen

WITH A COVEL No. 15 SURFACE GRINDER!

Work spoilage means lost time, production, and materials. When a part reaches the surface grinding point, it invariably is 90% finished. Complete loss results should the grinding wheel DROP INTO the work. Such an accident *absolutely* cannot happen on a COVEL No. 15 because:

THE SPINDLE REMAINS STATIONARY WHILE THE WORK *MOVES UP* TO THE WHEEL

This simple but vital design feature is only one of many reasons why plant men prefer the COVEL No. 15.

Set-up on the Covel No. 15 (6" x 18") Hand Feed Surface Grinder. Spindle is stationary; table has full 11" vertical travel. Three spindle speeds make it ideal for short production runs where quick set-ups, accurate grinding of odd shaped pieces, mean reduced production costs.

See Your Nearest Covel Dealer Or Write For Bulletin AM-65

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

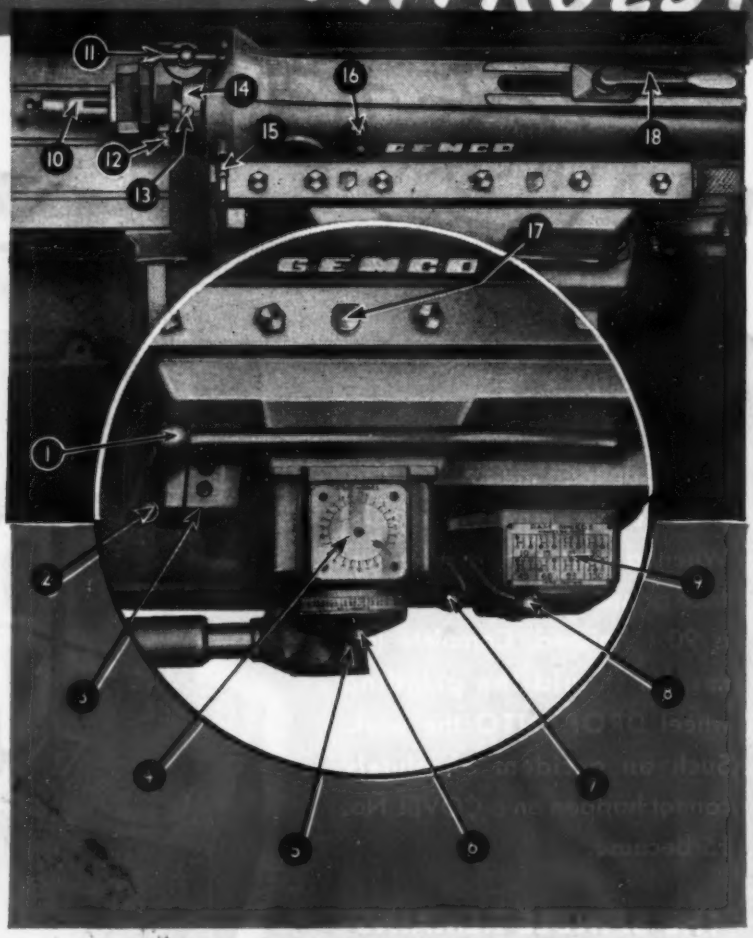
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

CENTRALIZED CONTROLS!

for Simple, Speedy, Economical Operation of

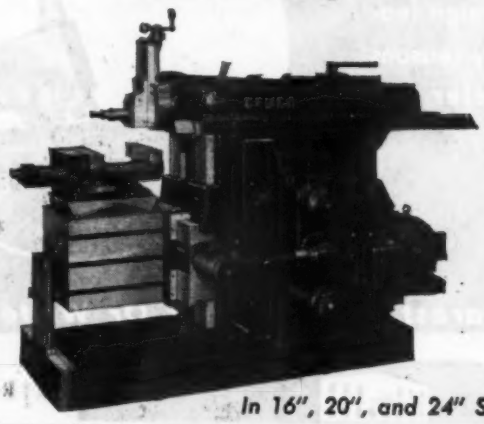
GEMCO SHAPERS

Check these 18 handy controls of the GEMCO Shaper. Note how they are all arranged for greatest convenience to the operator. This simplifies and speeds up the work—and cuts costs.



1. Main control lever for ram movements.
2. Electric switch lever for control of rapid traverse motor.
3. Start and stop buttons for drive motor as furnished with rapid traverse machines.
4. Stroke indicator dial & pointer, direct reading.
5. Shaft for operating stroke adjusting mechanism.
6. Feed adjusting lever and dial, direct reading.
7. Shift lever for high speed gears of transmission.
8. Shift lever for back gears of transmission.
9. Ram speed selection chart, indicating relative position of shift levers (7 and 8).
10. Tool post and clapper box of tool head.
11. Feed spindle lever of tool head.
12. Locking device for tool slide.
13. Adjusting screw for gib of tool slide.
14. Tool head base, graduated.
15. Stud for operating clamping means of tool head.
16. Stud for operating ram positioning spindle.
17. Inspection fitting for lubrication of ram gib.
18. Lever for clamping rocker arm linkage to ram.

GEMCO Multi-Purpose SHAPERS



★ *Exclusive* **"LUBRIGARD" SAFETY DEVICE** Increases the Precision Life

In 16", 20", and 24" Sizes

Write today for Bulletin GC-12A

GENERAL ENGINEERING & MFG. CO.

SAINT LOUIS 4, MISSOURI

Manufacturers of PRECISION MACHINERY Since 1917

400 PIECES LIKE THIS...

IN 9½ HOURS ON A Cleereman DRILLING MACHINE

Less than 1¼ minutes is required to finish one of these blower housings. It is bored through the center boss, the outside diameter of the boss is turned, and the interior and bottom of the piece is machined, all in one operation, in a special fixture attached to a Cleereman Drilling Machine. Limits are 0.001 in. on the diameter of the large bore, 0.001 in. on the depth of the large bore, and 0.0005 in. on the diameter of the small bore.

It will pay you to investigate the advantages of Cleereman Drilling Machines and Cleereman Jig Borers. Write for catalogs!

ARMY E NAVY

ADDRESS—

BRYANT Machinery & Engineering Company

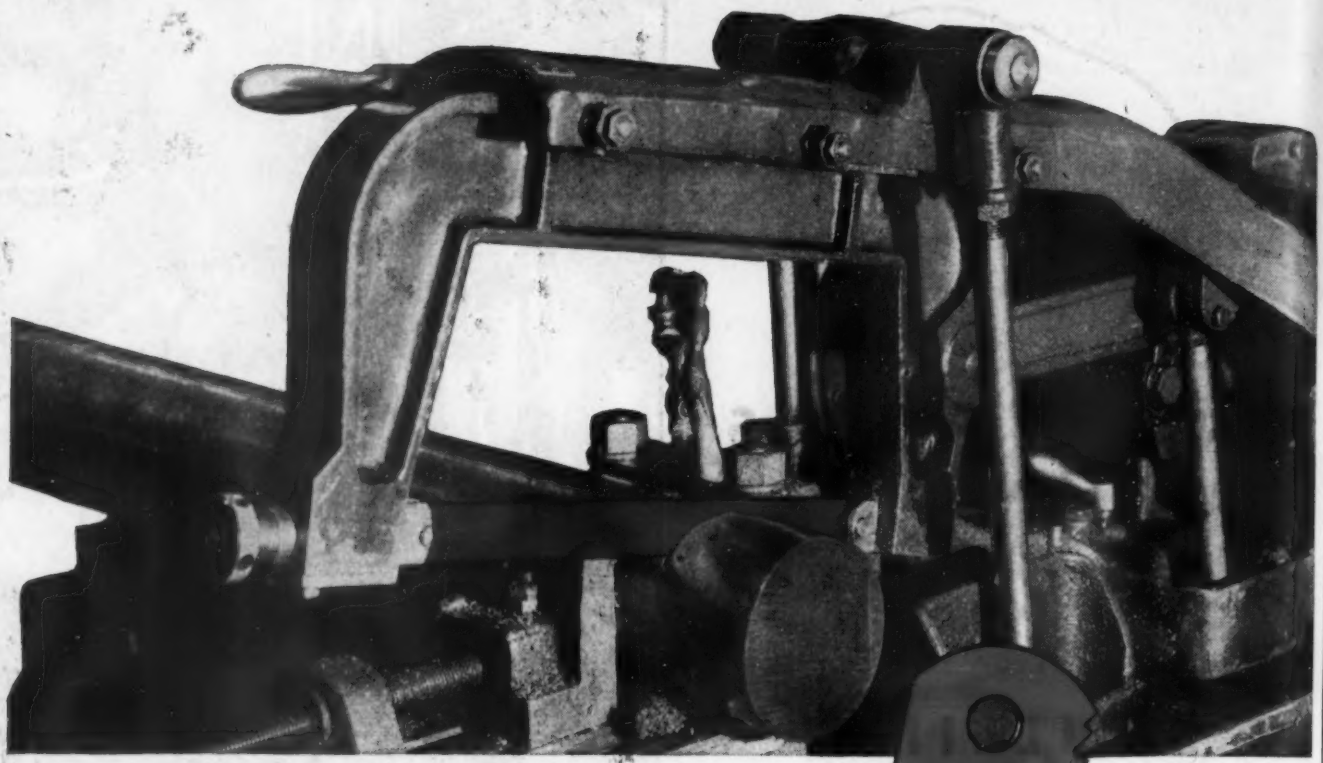
400 WEST MADISON STREET
CHICAGO 6, ILLINOIS

AFFILIATED WITH

CLEEREMAN MACHINE TOOL CO. MANUFACTURER OF PRECISION JIG BORERS & DRILLING MACHINES

Get More Cuts Per Hour and More Hours Per Machine with

SIMONDS "Red End" HACKSAW BLADES



THESE rugged "Red End" Blades for power-machine use are made to take the toughest service, *and to keep on taking it.* Smoother, straighter cutting . . . higher production . . . longer blade life . . . all these *extras* are now possible through Simonds 100% quality-control, and through Simonds new scientific method of tensioning power hacksaw blades to each particular job on which they are used. "Red End" Blades are made from Simonds own special electric steel, either standard, molybdenum, or high-speed. Order from your dealer *now.*

SEE SIMONDS NEW SOUND FILM, 16 mm in full color, showing how to choose the right "Red End" Blade for each job, and how to get the most out of it *on the job.* Have your dealer arrange to show it to *your* operators, in your own shop, without cost or obligation.

BRANCH OFFICES: 1350 Columbia Rd., Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 51 W. Trent Ave., Spokane 8, Wash.

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS

CUT THE WAR SHORT... BUY WAR BONDS... AND THEN BUY MORE WAR BONDS

Oakite Cleaning

HELPS MAKERS OF

MORTAR SHELLS

MEET CRITICAL SCHEDULES

Fast-Working Oakite Materials and Methods Speed Cleaning, Rust Removal and Surface Conditioning Operations!

IN the plants of many leading prime contractors producing much needed 60 mm., 80 mm. and 4.2-inch mortar shells and tubes, there is an effective Oakite cleaning material and method at work helping to provide trouble-free, smooth-running production.

Ratio of Rejects Reduced!

Specially designed, time-saving Oakite materials and thorough, effective Oakite methods are playing their part in helping reduce the ratio of rejects after such important operations as machining, brazing, soldering and welding.

Other Critical Items

Other critical items on which specialized Oakite materials are helping expedite essential production are large and small caliber ammunition, rocket shells, gun tubes, bombs, tanks, armor plate, and other war matériel.

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Our Technical Service Representative near you is available at all times for consultation. He will gladly give you the benefit of his own experience—and that of the far-flung Oakite organization—in cleaning mortar shells and tubes, large and small caliber shells and cases, bombs, etc. Call him or write us direct, giving brief details of your problem.

OAKITE PRODUCTS, INC., 34E Thames Street, NEW YORK 6, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS... METHODS... SERVICE

CLEANING FOR EVERY CLEANING REQUIREMENT

Equipped with Self-Indexing Hexagon Turret

SIMPLIFIED! No complicated features! No "unwanted equipment." You get the Oster No. 601 "RAPIDUCTION" with just the features YOU specify . . . either with the self-indexing six-position turret or with a plain saddle and single tool post . . . either with the WORM DRIVE (for smooth, ample power to make unusually heavy forming cuts) or with the DIRECT DRIVE (for high spindle speeds up to 3000 R. P. M. required for small diameter work or on non-ferrous metals).

Those, and other features, actually give you a "standard-special" machine but with no special costs. Write for full description. Ask for Catalog 27-B.

OSTER

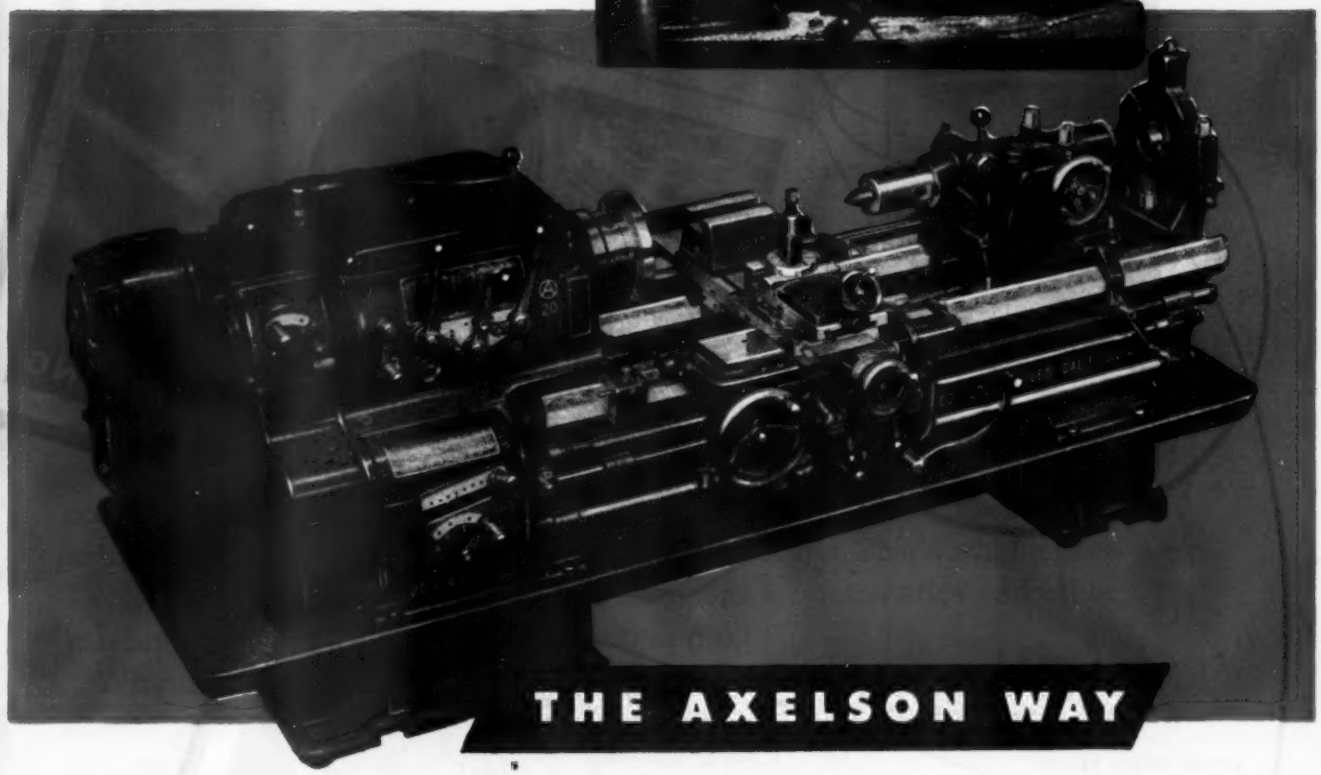
"Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

That's it—

Exactly!

...a figure of speech materializes at the chuck of a veteran AXELSON LATHE.



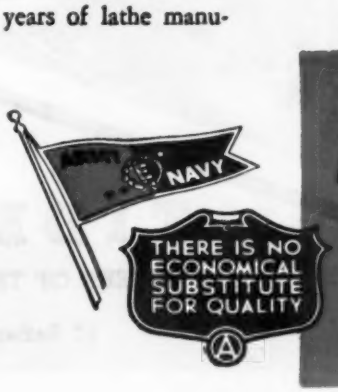
THE AXELSON WAY

The master mechanic at the old-style belt driven Axelson Lathe shown in the operational picture above, reads his "mike" and knows that the close-tolerance specifications have been met—right on the dot. For even the oldest Axelson Lathes now in operation still are delivering fast reliable production. "Quality First" has been the Axelson slogan down through the company's thirty years of lathe manufacturing.

Today's great Axelson Lathe truly "has everything:" Speed, precision, durability and ease of operation. Tip-top design, materials and workmanship tell the full story. *Before you buy any lathe investigate Axelson.*

AXELSON MANUFACTURING COMPANY
6160 South Boyle Ave. (P. O. Box 98, Vernon Station), Los Angeles 11, California • 50 Church Street, New York City 7 • 3844 Walsh Street, St. Louis, Mo.

BUY WAR BONDS



AXELSON LATHES

Dependable for over a Quarter Century

THE 2-JOB OIL

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

INDUSTRIAL TYCOL OILS-GREASES

TIDE WATER

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL
Eastern Division:
17 Battery Place, New York 4, N. Y.

THAT DOES *Both Jobs Better*

TYCOL

DUAL PURPOSE OIL

Yes, you use only *one* oil for *both* cutting and machine lubrication, and you get better results both ways.

Better cutting performance because Tycol "Dual Purpose" increases speeds, feeds, and tool life . . . minimizes build-up on cutting tools.

Better machine lubrication, too, because this unique oil gives thorough protection to gears and bearings . . . and it won't corrode nor harmfully affect ferrous or non-ferrous metal parts.

What's the reason for this two-way superiority? Tycol Dual Purpose Oil contains precisely enough sulphur for high speed cutting, but the sulphur is in *combined* form. It won't separate, won't filter out. That's what makes Tycol Dual Purpose such an effective lubricant for automatics and other machines, as well as an exceptional cutting oil.

Why not see for yourself how Tycol Dual Purpose can step up cutting speeds and improve machine performance in your plant? For complete information call or write any Tide Water Associated office.

FREER CUTTING, LONGER TOOL LIFE

By minimizing build-up on cutting tools, Tycol "Dual Purpose" permits faster cutting — lengthens tool life between grinds.

PROTECTS BEARINGS AND GEARS

Won't corrode, or harmfully affect copper or copper alloy machine parts. Result — lower maintenance costs.

EXCELLENT WITH CARBIDE TOOLS

Tycol "Dual Purpose" brings out the best cutting performance of carbide tools, without attacking the binder.

ASSOCIATED OIL COMPANY

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TIDE WATER OIL COMPANY OF CANADA, LTD.
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..and NOW for HEAVY DUTY DRILLING and BORING

this Standard LeMaire No. 20 HYDRAULIC VERTICAL DRILLING MACHINE

BUY MORE BONDS

● ● ● ● Designed and built for drilling and boring heavy parts to assured accuracy. Machine is furnished with a spindle having a milled drive slot for multiple head adaptation. Provision is made for Morse Taper adapter for single spindle operations.

The head slides on ways in the column, actuated for rapid advance and feed by hydraulic cylinder. The machine shown here is equipped with 14-spindle head having bushing plate and guide bar arrangement. It is set up to drill eight holes 17/32" diameter and six holes 39/64" diameter. Then while part still remains in fixture, 6 reamers are substituted for 6 of the drills to ream .6245 holes. (Magic Quick Change Chucks are used.) By performing three operations without disturbing initial setting of part, you are assured of increased production and greater accuracy. A manually operated shuttle-type fixture is provided to facilitate loading and removing of part with hoist.

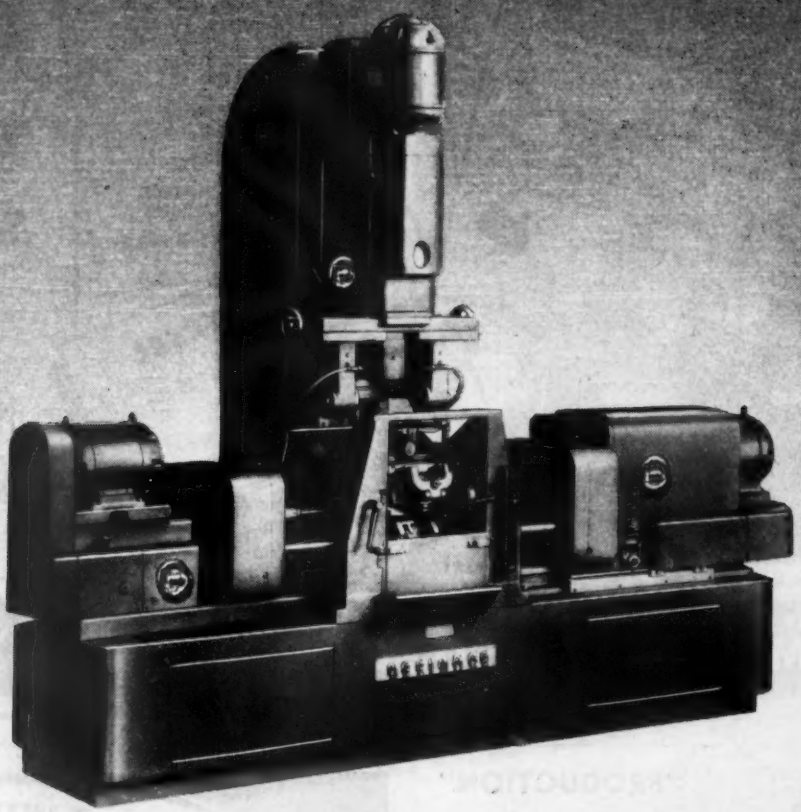
Rigid box type table 25" x 29" maximum is standard equipment. Index table 42" maximum, manually or automatically operated, can be furnished at extra cost.

LeMaire

BUILDERS OF SINGLE AND MULTIPLE SPINDLE MACHINES FOR BORING, DRILLING, REAMING, TAPPING, ETC.—TWIN RAM HYDRAULIC UNITS—MATCH-IT GEAR CHUCKS

LE MAIRE TOOL & MANUFACTURING CO., 2657 SO. TELEGRAPH RD., DEARBORN, MICH.

HIGH PRODUCTION DRILL



● This three-way machine with five station indexing fixture shows the adaptability of Defiance Production Drilling Units to a production machine. These newly developed, greatly improved Defiance Cam and Hydraulic Units are available with standardized base and column design—for either horizontal or vertical mounting. Bases and columns are of welded steel to the dimensions required by the individual job . . . fixtures also specially designed for each job.

More and more shop men have learned through experience that Defiance-built Machines are "tops" in dependability, long life, and low-cost maintenance. Write for catalog.

Defiance Machine Works, Inc., Defiance, Ohio.

ARMY E NAVY

DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE 1850

MOREY TURRET LATHES

for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

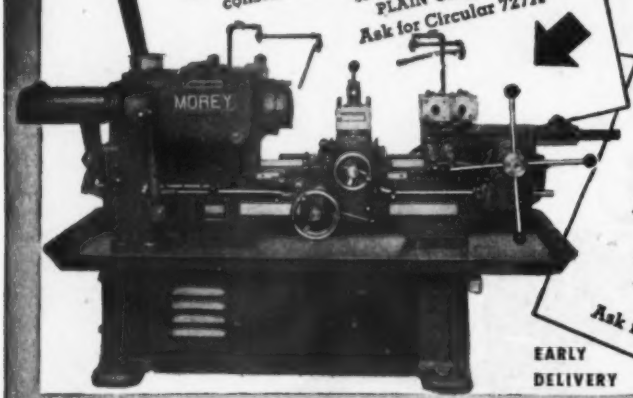
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



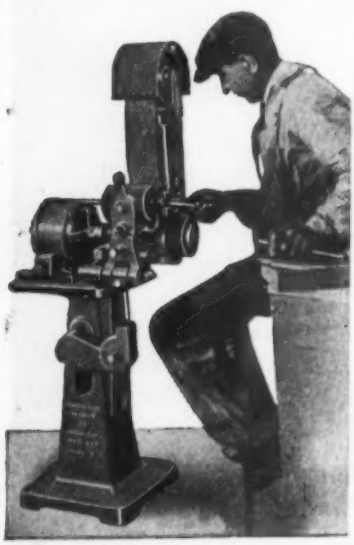
EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK



"PRODUCTION"
Type S
SURFACER
POLISHER
BUFFER
. . . for cylindrical or flat work

This versatile machine is designed to combine centerless feed polishing with vertical or horizontal belt grinding, surfacing, polishing or buffing. It is equally well adapted to cylindrical polishing or straight line finishing of flat work. It is an ideal machine for grinding or polishing such materials as metals, rubber, fibre, wood, etc.

It will handle cylindrical work from ¼" to 1" diameter. Work is fed automatically; no centering or chucking required. Flat or irregular work may be finished by hand manipulation.

SPECIFICATIONS

Capacity — Centerless Feed — ¼" to 1" diam.
Abrasive Belt—4" wide; 60" long-endless
Motor—1 H.P.—1750 R.P.M.
Belt Speed—3200' per min.
Table—4½" wide x 13½" long

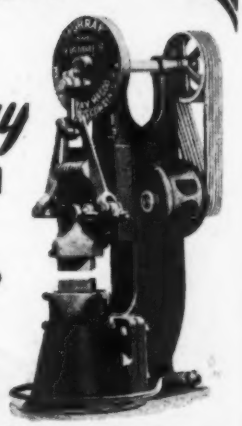
Write for illustrated literature giving full details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

YOU CAN DO A WIDE RANGE OF MAINTENANCE WORK

Murray Power Driven Forge HAMMER



Operated either Electrically or Mechanically

Made in 5 SIZES

ADAPTABLE for a wide range of light or heavy work, extremely powerful, yet simple in design and so flexible in operation. Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Built for long, dependable use, with low maintenance cost. The ram design is a special feature. The ram is free from obstruction so that the operator has full vision of the work being done —adjustable for different thicknesses of material and dies. All models can be furnished for motor or belt drive.

Complete information upon request. Ask about repair parts service also.

D. J. MURRAY MANUFACTURING CO.

WAUSAU — MURCO — WISCONSIN

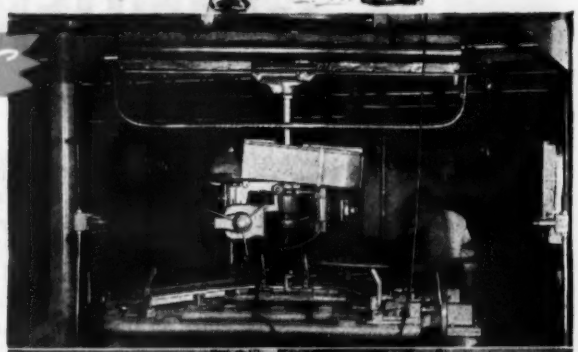
CAN MANUFACTURING COSTS be reduced after the war?

Walker-Turner Machine Tools have effected remarkable savings in war plants. Their wide range of operating speeds permits selection of optimum (most economical) cutting speed for every material. Simple, easy operation makes every man-hour more productive. Streamlined flexibility permits economical tooling set-ups. Low price and low power consumption keep capital investment and operating costs at a minimum.

Use Walker-Turner Machine Tools for the many jobs within their range and reserve heavy equipment for heavier work.

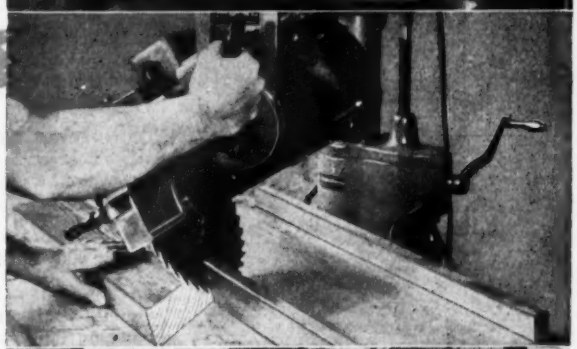
Walker-Turner Co., Inc., Plainfield, N. J.

METALS



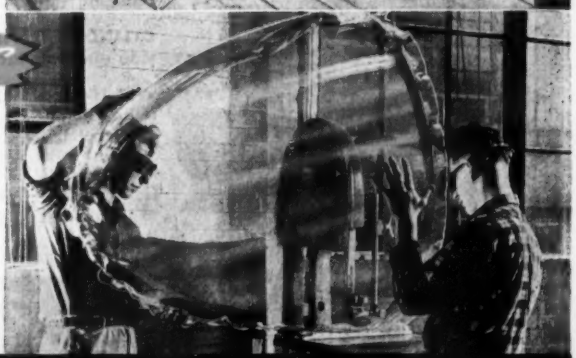
Fast positioning and wide range of speeds make W-T Radial Drills ideal for this job at the plant of a large aircraft builder.

WOOD



W-T Radial Saw cross-cuts, rips, dadoes, miters, routs, tenons. Also available in metal-cutting model

PLASTICS



Speed range from 61 to 5300 s.f.m. in this W-T Band Saw cutting Plexiglas bomber nose at Rohm & Haas

CERAMICS

W-T 15" Drill Press has high speeds and spindle stability for fine drilling at General Ceramics plant.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

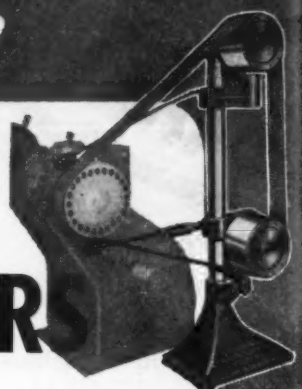
Hammond

OF KALAMAZOO

Wet-n-Dri 4" belt model — Type 400

Abrasive Belt GRINDERS-POLISHER

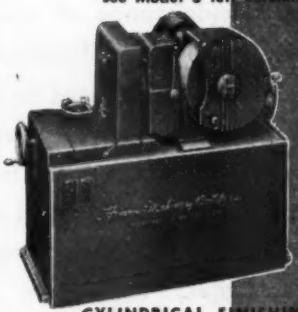
FOR FASTER, BETTER FINISHING



BACKSTAND No. [illegible] (shown) see Model 3 left column

Flexible Belt Unit, 2" type F-2

Here Hammond offers you the machines for doing a better grinding and finishing job with abrasive coated belts. They are built to the highest standard of machine tool construction and provide low cost, high production unit for the particular job to be done. Whatever your problem . . . investigate the available Hammond machine for handling it.



CYLINDRICAL FINISHING UNIT — Model OD-[illegible] shown

FLEXIBLE BELT UNIT — Inexpensive bench or pedestal type for replacing the slow, more costly grinding and finishing methods now being employed throughout your plant.

GRINDER-POLISHER COMBINATION — Uses belts or wheels or both on same machine, whichever set up is required to do the job. Availible in bench and floor types.

BACKSTAND-POLISHING LATHE UNITS — handles heavy duty finishing jobs faster . . . better.

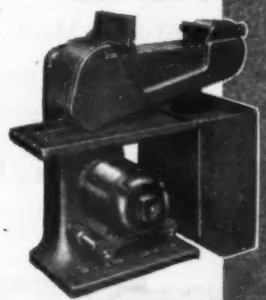
BACKSTANDS — Either bench or floor types for converting your present Polishing equipment into belt finishing units.

CYLINDRICAL FINISHING UNITS — for ¼" to 9" outside diameter tubes, rods, bars.

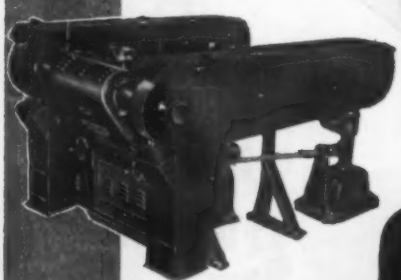
WET-N-DRI 4" and 6" Horizontal-Vertical GRINDERS, either bench or floor type units for high production, low cost finishing.

HEAVY DUTY — 8" and 10" Vertical floor type GRINDERS — Wet-n-Dri operating, handle wide range of small and large parts to be finished.

GRINDER-POLISHER COMBINATION — Use either belts or wheels or both, 3" belts

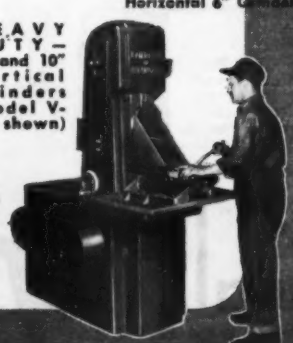


WET-N-DRI — Vertical and Horizontal 6" Grinders



BACKSTAND No. 3 and Hammond Variable Speed Polishing Lathe Unit

HEAVY DUTY — 8" and 10" Vertical Grinders (Model V-10 shown)



Hammond Machinery Builders INC.

OTHER HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

1618 DOUGLAS AVE. KALAMAZOO 54, MICH. • EASTERN BRANCH: 71 W. 23rd ST. NEW YORK 10, N. Y.

GEARGRIND
High Speed Constant Velocity
UNIVERSAL JOINTS

● Catalog covering standard Rzeppa Constant Velocity Universal Joints will be mailed on request.

● To meet special aviation requirements we have designed special, constant velocity universal joints to operate at speeds up to 9000 R.P.M. between shafts subject to a maximum deviation from normal of 6°. Our engineers will be glad to discuss the design of special universal joints where the proper ratios between speed and angularity are essential to satisfactory, trouble-free operation.

ARMY NAVY

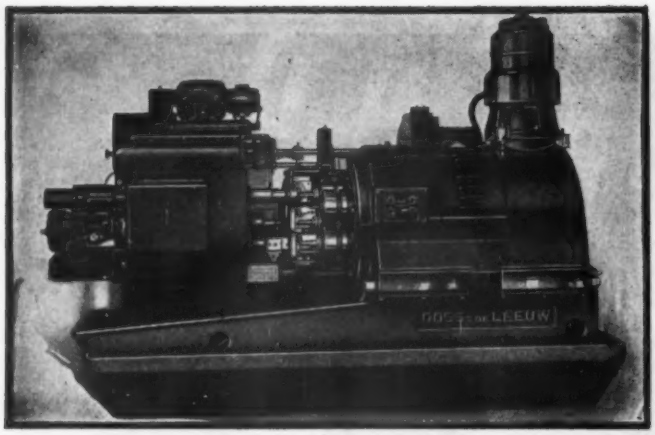
FORMED WHEEL GRINDING

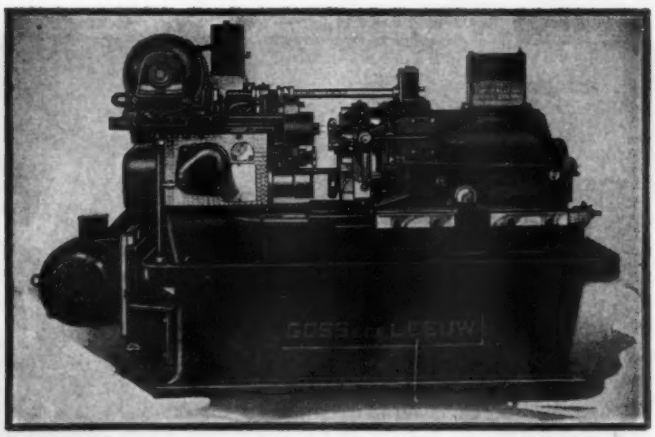
Investigate the complete line of GEARGRIND Machines for the Formed Wheel Grinding of external and internal gears, external and internal involute splines, straight splines, serrations and racks. Also special GEARGRIND Machines for special grinding operations.

CONTRACT GRINDING SERVICE

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICH. U.S.A.





WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

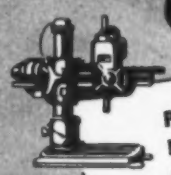
On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

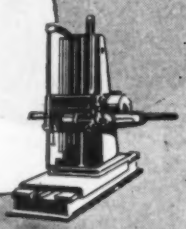
Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

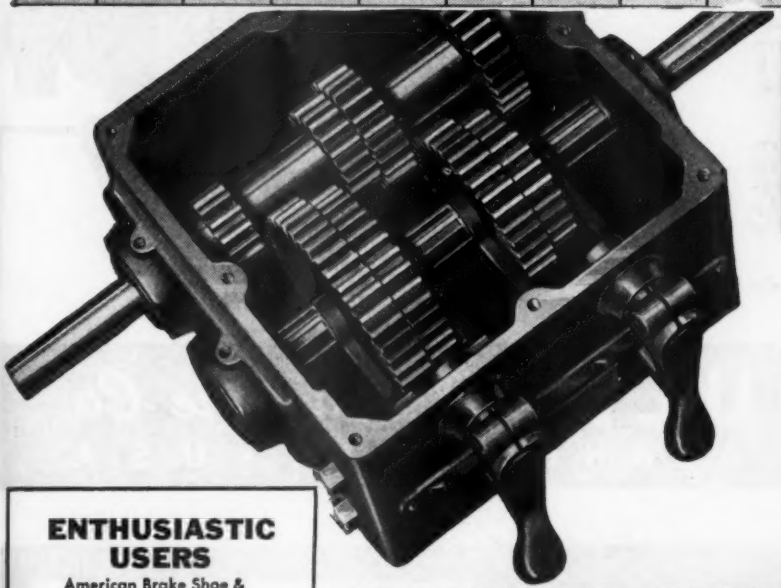
CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

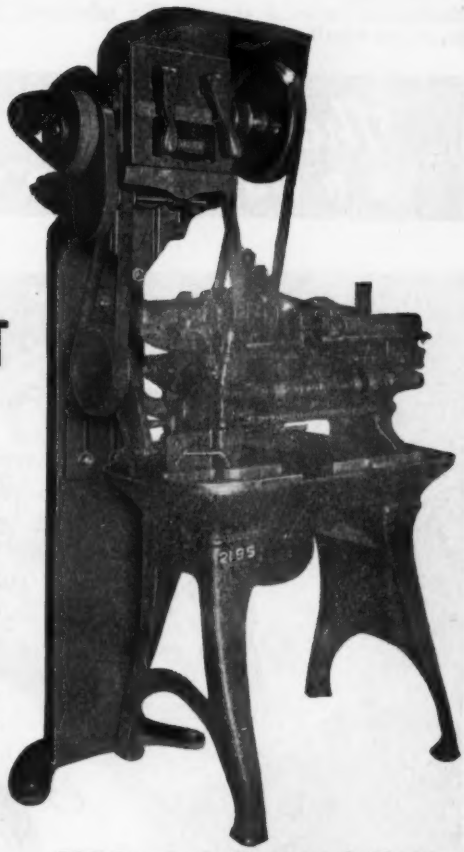
FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

• SPEEDS UP PRODUCTION • CUTS DOWN COSTS



TURNER
UNI-DRIVE
Motorizes Machine Tools



ENTHUSIASTIC USERS

American Brake Shoe & F. Company
Kellogg Division
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Augusta Arsenal
Bendix Aviation Corp.
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INCREASES OUTPUT UP TO 300%

Many of the famous companies listed at the left report production increases ranging from 25% to 300% and drastic reductions in costs after installing Turner Uni-Drives.

There are no belts to shift on the Uni-Drive. Drives to large step of cone at all speeds. Eliminates overhead line and counter shafts. Provides all advantages of geared head with belt drive smoothness. See your dealer or write for details.

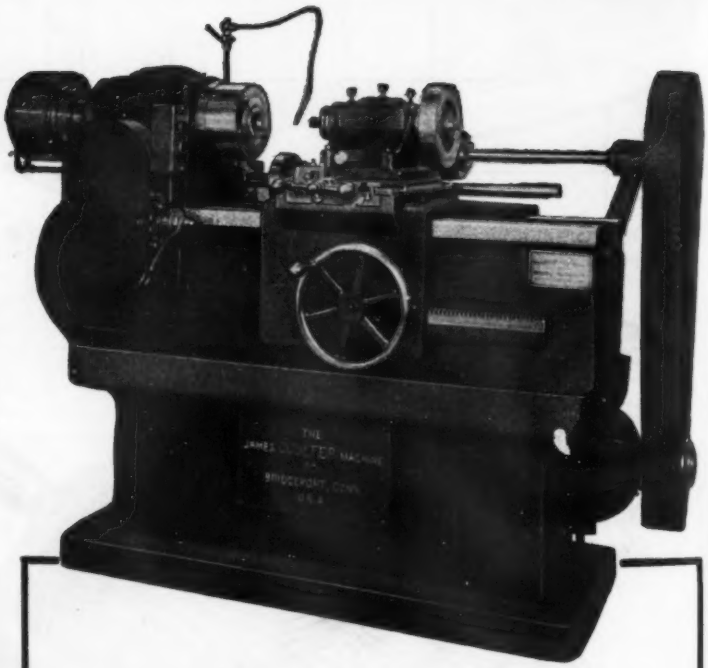
FOR Brown & Sharpe and Cleveland Automatic Screw Machines; Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines.

NOW AT WORK FOR VICTORY ★★★

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. Kansas City 8, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

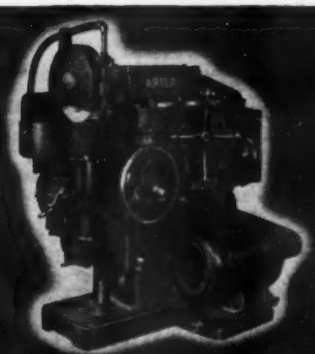
Send for Descriptive Bulletin giving full information.

The James **COULTER** *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

ARTER

The versatility of ARTER ROTARY SURFACE GRINDERS is again demonstrated in the precisely ground parts of the Hamilton Navigation Master Watch.

ARTER is proud to play a part in the production of this marvel of time keeping precision.



ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U.S.A.

LATROBE

RED ARROW

—The Superior Cast Alloy for Metal Cutting Tools

Men and material on way to Luzon — Official Coast Guard Photo

for the tools of war

America's revived war production program demands the greatest possible output from every machine tool every working day.

Latrobe RED ARROW, the Superior Cast Alloy, is ideally adapted to those cutting operations where speeds are required beyond those obtainable with ordinary cutting steels.

Yet Latrobe RED ARROW will function at these higher speeds even with old equipment without danger of breakage . . . and with far less wear . . . consequently, with greater savings in production time!

These Latrobe Red Arrow Inserted Blades help speed production. Used in this boring bar, four times the pieces per grind were produced, compared with previous cast alloy used.

If you have a problem involving cutting or die steels, a Latrobe Service Engineer will be glad to help. 'Phone or write.

Latrobe ELECTRIC STEEL COMPANY

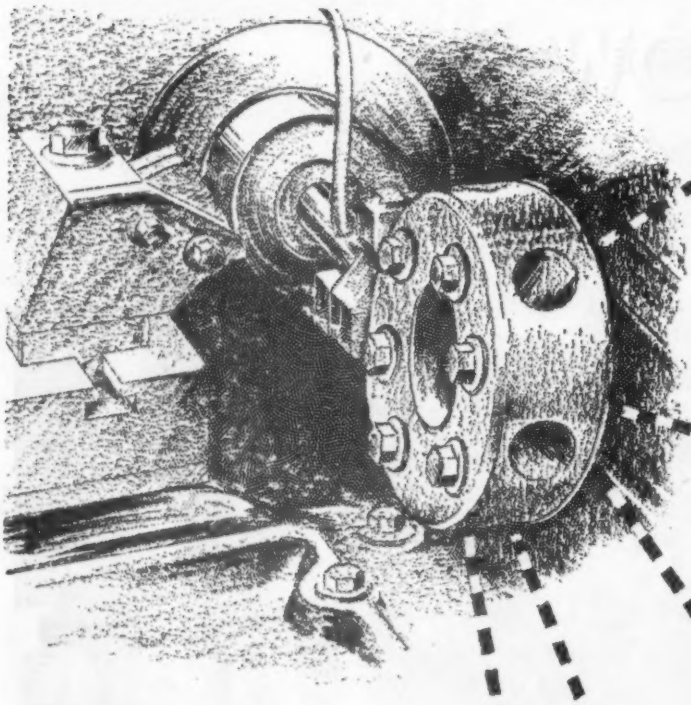
MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

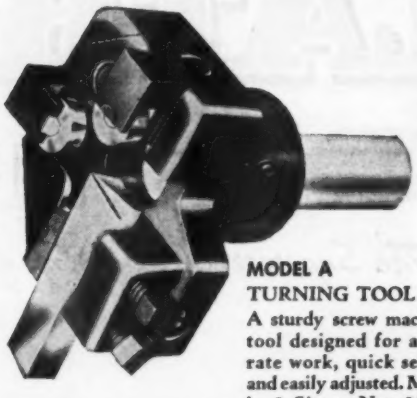
HIGH SPEED STEELS · DIE STEELS · TOOL STEELS · STAINLESS

R-2

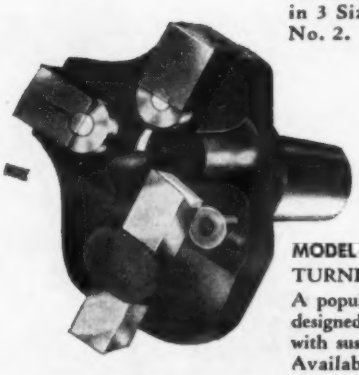
Maximum SCREW MACHINE *Production*

With Boyar-Schultz SCREW MACHINE TOOLS



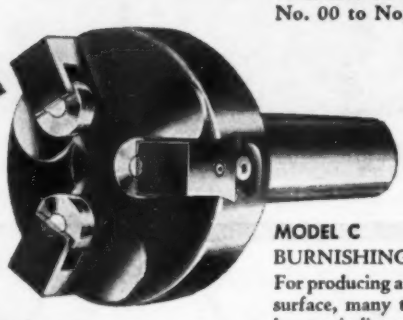


MODEL A
TURNING TOOL
A sturdy screw machine tool designed for accurate work, quick set-up and easily adjusted. Made in 3 Sizes—No. 00 to No. 2.

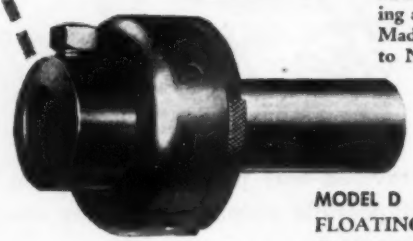


MODEL B
TURNING TOOL
A popular type of tool, designed for heavy cuts with sustained accuracy. Available in 3 Sizes—No. 00 to No. 2.

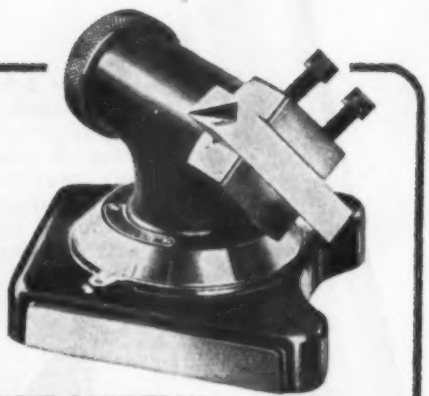
¶ Superior Quality Competitively Priced ¶ Sturdily Built for Long Life ¶ Correctly Designed for Quick Set-up ¶ They Are Tools That Promote Lower Operating Costs.



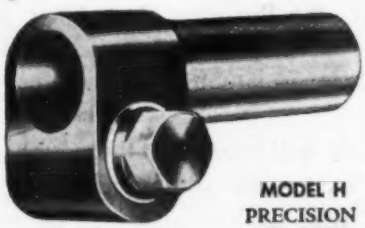
MODEL C
BURNISHING TOOL
For producing a smoother surface, many times saving a grinding operation. Made in 3 Sizes—No. 00 to No. 2.



MODEL D
FLOATING TOOL HOLDER
Compensates for the inaccuracies often occurring between tool and work. Made in 7 Sizes—No. 00 to No. 6.



MODEL G UNIVERSAL
TOOL BIT GRINDING FIXTURE
Promotes increased production through uniformly ground tool bits. With every bit ground the same, set-up time is reduced, closer tolerances and better finish can be expected and tool steel is saved. Used for both right and left hand tools.



MODEL H
PRECISION ADAPTER
A permanent screw machine tool that permits using more than one size tool on a given size screw machine. Made in 4 Sizes.

Protect
YOUR TOOL DOLLAR WITH THE FINEST

Protect
YOUR COUNTRY WITH WAR BONDS

WRITE FOR CATALOGUE

BOYAR-SCHULTZ CORPORATION
2109 WALNUT STREET CHICAGO 12, ILLINOIS

PRESSURE VESSELS

It is common to nearly all pressure vessels that they must withstand much more than pressure. Corrosives and rapidly changing temperatures subject the metal to conditions of varying severity. Midvale, with one of the oldest and most complete metallurgical laboratories in the industry, combines knowledge with experience. Midvale metallurgists and engineers have shared in the planning and design of notable installations in the oil field and the process industries. And because their studies extend to operation experience, they are doubly equipped to meet unusual and exacting problems.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
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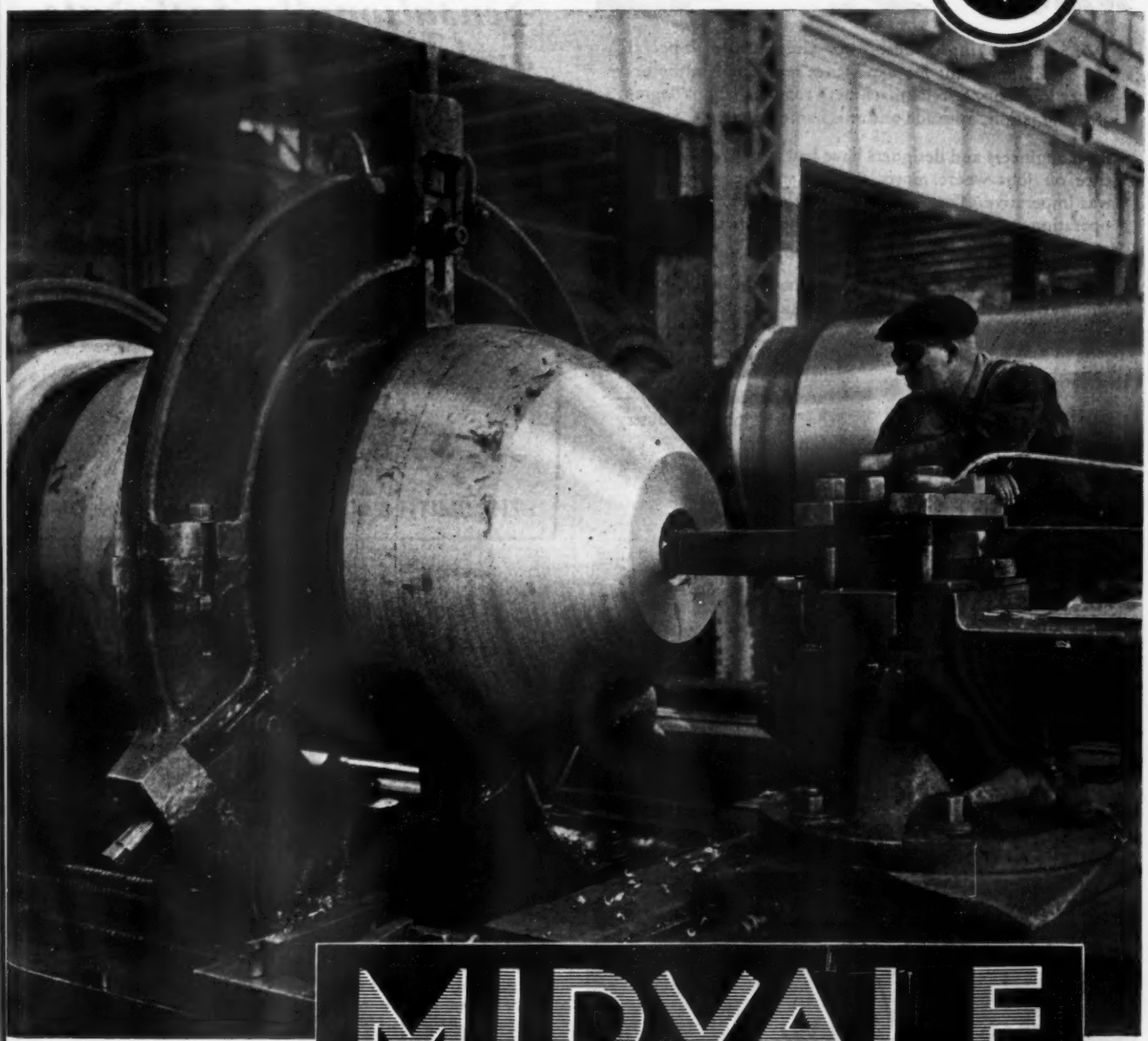


MIDVALE

Custom Steel Makers to Industry

YES, Miss Dingle, designing and building Special Machinery calls for experience not found in the ordinary job shop. Special machinery requires a high degree of imagination, aptitude and mechanical sense.

Fenn engineers and designers have had many years experience on jobs where more efficient, speedier production was imperative. They know there is a cost limit to certain operations; and they are aware that the properly designed machine must pay out in a short life span.

Special machines that we have designed and built during the war have been instrumental in aiding the war effort by cutting costs, reducing time of operations which increases production and thereby speeds delivery—the vital job of industry right now.

FENN SPECIAL MACHINERY

- TOOLS
- FIXTURES
- MACHINF PARTS
- SPUR GEARS
- INTERNAL GEARS
- GUN PARTS
- AIRCRAFT PARTS
- SUB-ASSEMBLIES
- QUICK ACTION VISES
- SPECIAL MACHINERY

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT
★
Special Machinery For Efficient Production

Sensationally Fast, Safe and Widely Applicable..

this method is rapidly displacing other cutting methods. Learn all about it and the machines that make it possible —

Tannewitz HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

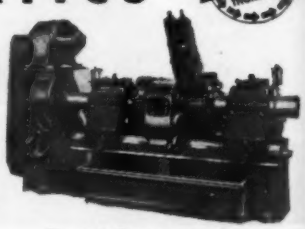
SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

Horizontal ROTO-MATICS

DAVIS Roto-Matic THOMPSON

When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. *Bulletins 110 and 120* are available for suggested solutions to your problems.



No. I-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

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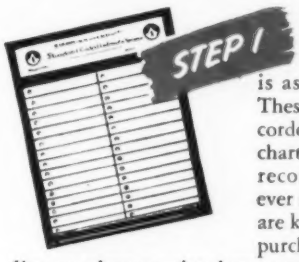
Take time now to find out about Standard's

SO-CO 1 CODED SO-CO 2 LUBRICATION

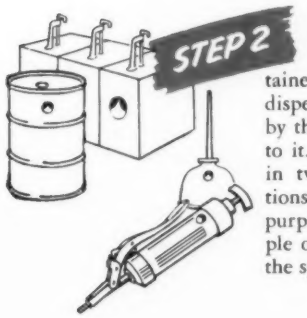
It will help you cut maintenance and lubricating costs when reconverting.

STANDARD Coded Lubrication Service is the simplest method known for getting the *right* lubricant in all the *right* places. With it, you are assured of better lubrication, and maximum life and production from your equipment.

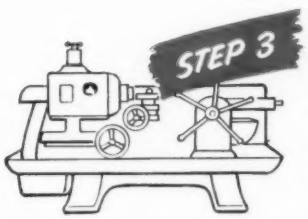
The following three steps illustrate just how simple it is to install:



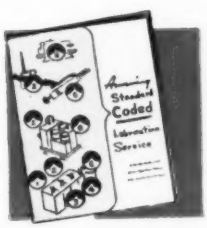
Each lubricant used in your plant is assigned a number. These numbers are recorded on a lubrication chart—this is the only record-making that is ever needed—and copies are kept in the oil room, purchasing department files, or wherever else they may be useful.



The lubricant in each storage container—barrel, drum, or dispenser—is identified by the number assigned to it. Numbered decals, in two color combinations, are used for this purpose—another example of the simplicity of the system.



All points lubricated in your plant are also marked with a numbered decal indicating *what* lubricant is to be used, and *where* it is needed.



This booklet gives a complete description. Write for a copy, or better still, have a Standard Oil Industrial Service Representative call and discuss this system with the men in charge of your lubrication. Call the local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you—or for a copy of the booklet.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

The ~~"art"~~ *Science* of greasemaking— and you, the "user"

NOT MANY YEARS AGO, the "art" of greasemaking was handed down from father to son, or from the master greasemaker to his favorite apprentice. The greasemaker was a super-chef—his recipes a secret. Without

The "art" of greasemaking was handed down from father to son.

the magic word known only to the old-timer, the same ingredients and seemingly the same methods he used, produced anything but the expected results in the hands of the uninitiated apprentice.

Today, that picture is greatly changed. Greasemaking

The master greasemaker was a super-chef—his recipes a secret.

is no longer an art but a science. The "know-how" of the old-timer is duplicated and improved upon in the chemist's laboratory.

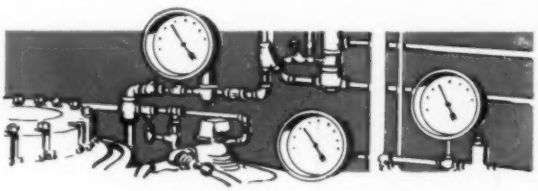
Control of the various steps in the process, once dependent upon the experienced "eye" of the greasemaker, has been taken over by modern scientific instruments—accurate measuring and weighing devices, precision temperature control instruments, scientific mixing kettles, etc.

A high degree of skill is still required, but it is in the hands of thoroughly trained greasemakers, who, with accurate instruments and with laboratory formulas and methods, can predetermine the results of their

. . . accurate temperature measuring instruments.

labor and get uniform products that accurately meet specification requirements.

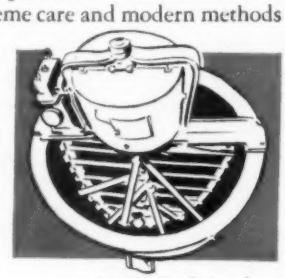
There was a time, too, when grease quality and consistency meant very little. The consistency of an axle grease on a wagon wheel had little effect on the speed of the wagon or life of the wheel. Today, however, high speed, precision anti-friction bearings, and heavily



. . . with laboratory formulas and methods.

loaded gears require accurate lubricant recommendations to save both power and wear.

All this explains why you will find the most advanced equipment and technique employed in the greasemaking department of Standard Oil. Only a small portion of the equipment is illustrated here. It can only indicate the extreme care and modern methods employed by Standard Oil to insure the highest quality and uniformity in the greases manufactured. And these include greases for practically every type of industrial application.



. . . scientifically designed grease kettles.

Standard Oil Lubrication Engineers will help you apply these products to give longer lasting protection to plant equipment and machines. Write Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois, for a Lubrication Engineer.

Buy more War Bonds

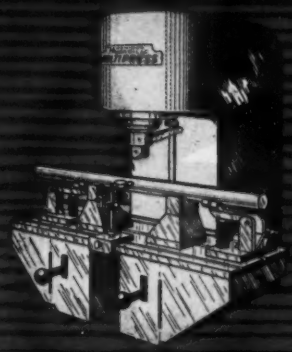
STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

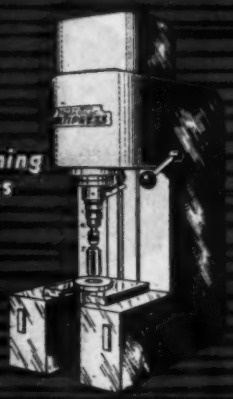
★ LUBRICATION ENGINEERING

Announcing MULTIPRESS

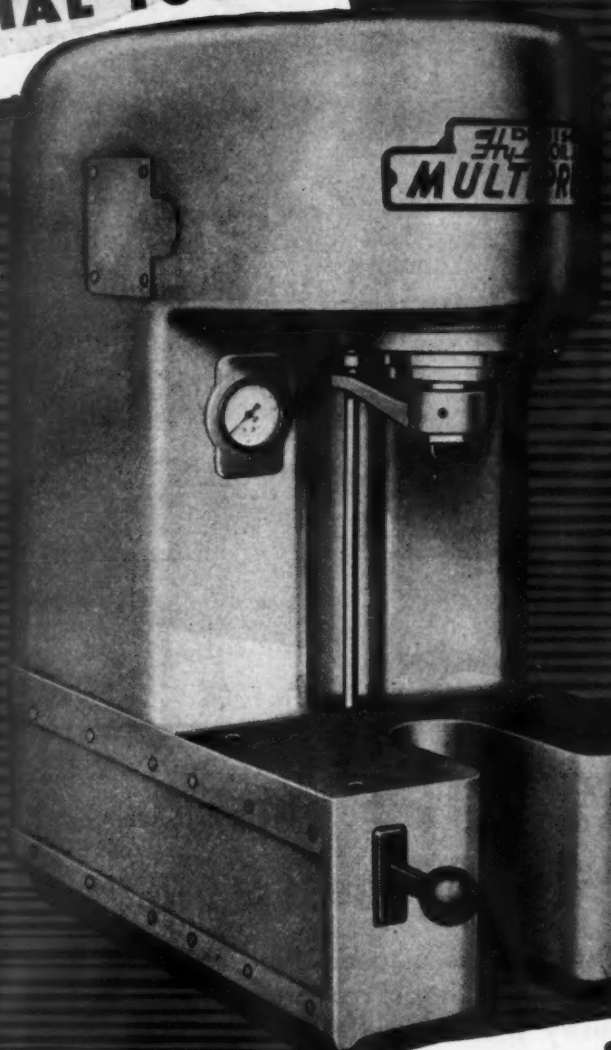
AN ENTIRELY NEW KIND OF INDUSTRIAL TOOL



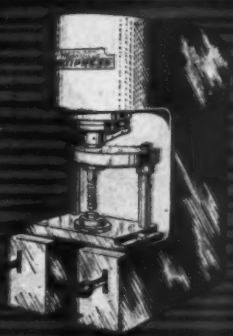
With Straightening Fixtures

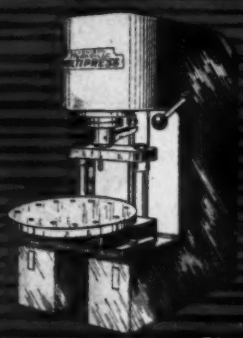


With Honing Fixtures

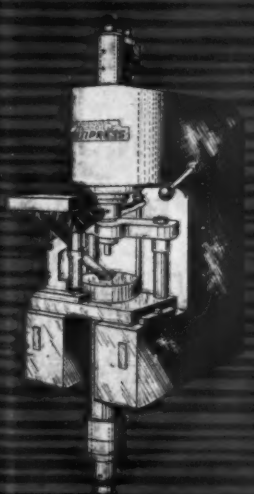


With Broaching Attachment

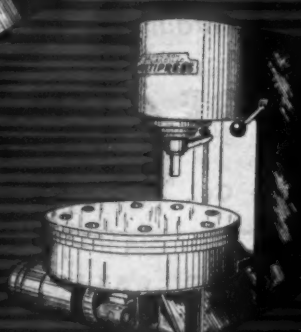




Showing Dial-Type Feed



Equipped for Automatic Palleting



With Motor Driven Indexing Table

For Scores of Production Jobs

A 4-ton production giant in midget form . . . a completely self-contained, bench-size, oil-hydraulic machine tool of amazing scope. MULTIPRESS delivers downward ram pressures of from 300 to 8,000 pounds . . . upward pressures to 5,000 pounds . . . in strokes which may be regulated from 6 inches to 1/16-inch . . . at ram speeds up to 200 inches per minute downward, and 300 upward! Its work-table measures 10½ x 16 inches without extensions. The opening between ram and table is 11 inches. In addition, there are fixtures and attachments for MULTIPRESS which fit it for almost every type of operation requiring pressure . . . sustained, in repeat strokes, synchronized with indexing tables, in single or automatically repeated cycles, and many other ways! Write today for details on this new HydrOILic tool of multiple uses!

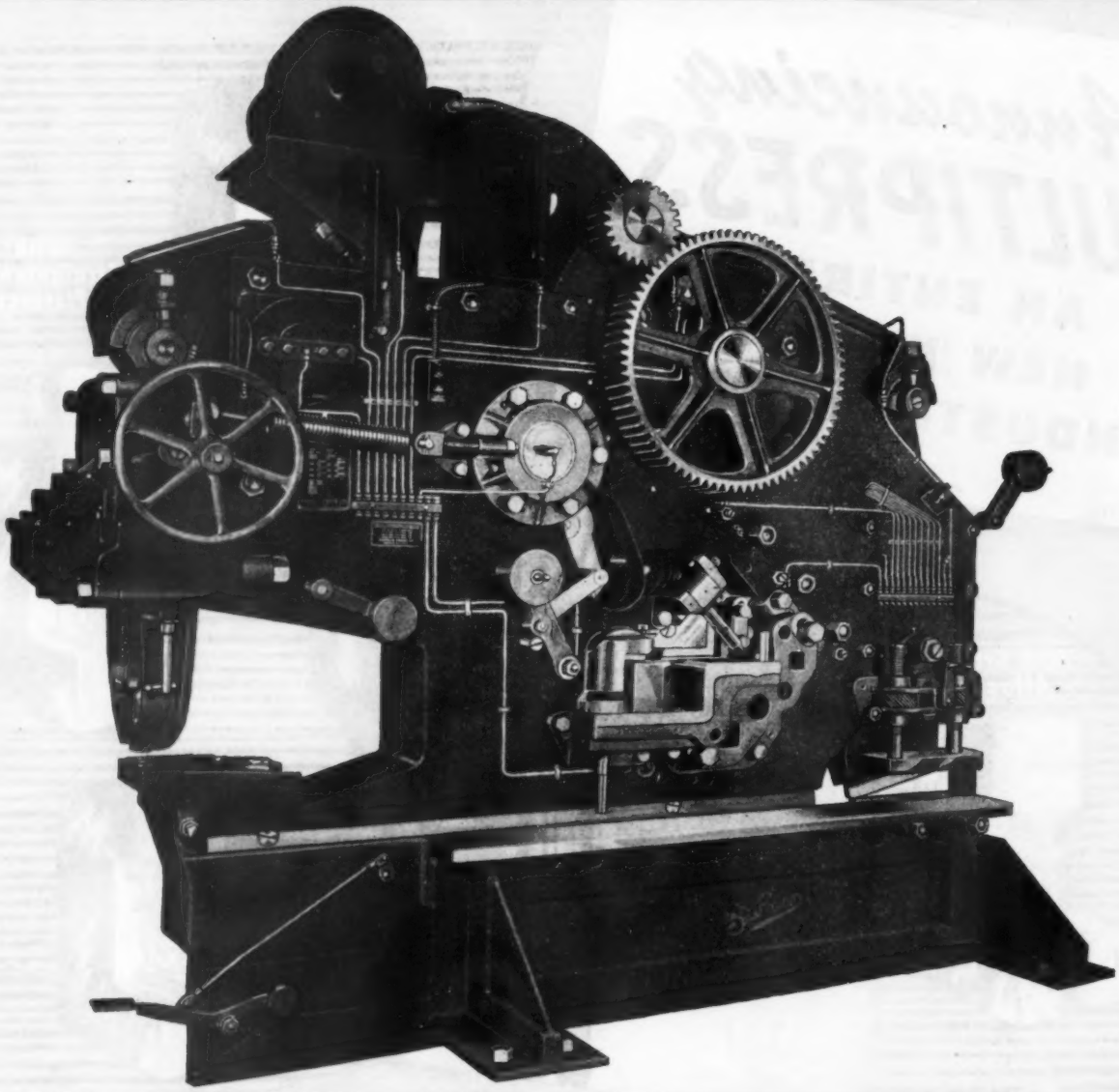
Basic Unit **$575.00** f.o.b. Col's.

The Denison Engineering Company

1164 Dublin Road, Columbus 16, Ohio

DENISON EQUIPMENT in APPLIED HydrOILics

HydrOILics INDUSTRY'S RIGHT HAND



Punches $1\frac{9}{16}''$ x $1\frac{1}{4}''$; cuts $6''$ x $\frac{7}{8}''$ Angles $3''$ Rounds, $2\frac{5}{8}''$ Squares, Shears $1\frac{1}{4}''$ Plates

Where work like that listed above is to be done, the Buffalo No. 4½ U.D. Machine shown here is the answer. Steel shops, railroad maintenance shops, steel mills and many other heavy industry shops find that Buffalo U.D. Machines speed up their production greatly. *Complete details contained in Bulletin 360A*

"Buffalo"

BUFFALO FORGE COMPANY
488 BROADWAY **BUFFALO, N. Y.**
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

COMBINATION PUNCHES
Shears and Bar Cutters

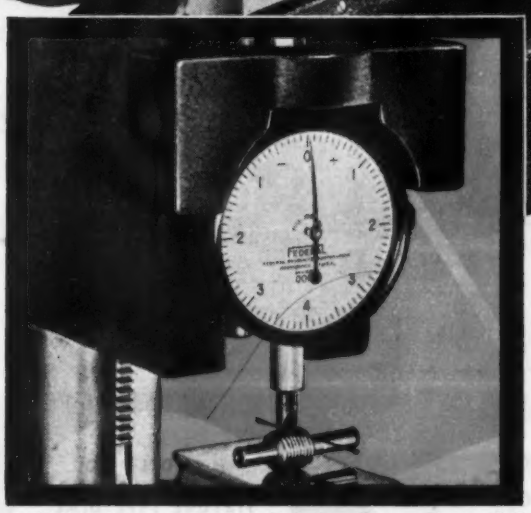
It's New - a COMPARATOR *with* MICROMETER HEAD *and* DIAL INDICATOR

YOU SET IT DIRECTLY WITHOUT MASTERS

The combination Micrometer and Dial Indicator Head incorporates its own Master. A complete set of Gage blocks, or masters, are not necessary. You simply set the micrometer to the required dimension, lock it, and then compare workpieces, etc.

MODEL 120 B-1

This comparator is very convenient for tool rooms and shops having miscellaneous job lots of duplicate workpieces. Anvil has both smooth and serrated surface.



THREE-WIRE THREAD MEASURING

is easy on this new comparator because the Micrometer Head enables you to read the actual dimension of the Pitch Diameter. The Dial Indicator then compares the diameters of other similar screw threads. The weight over the Indicator is for coarse threads.

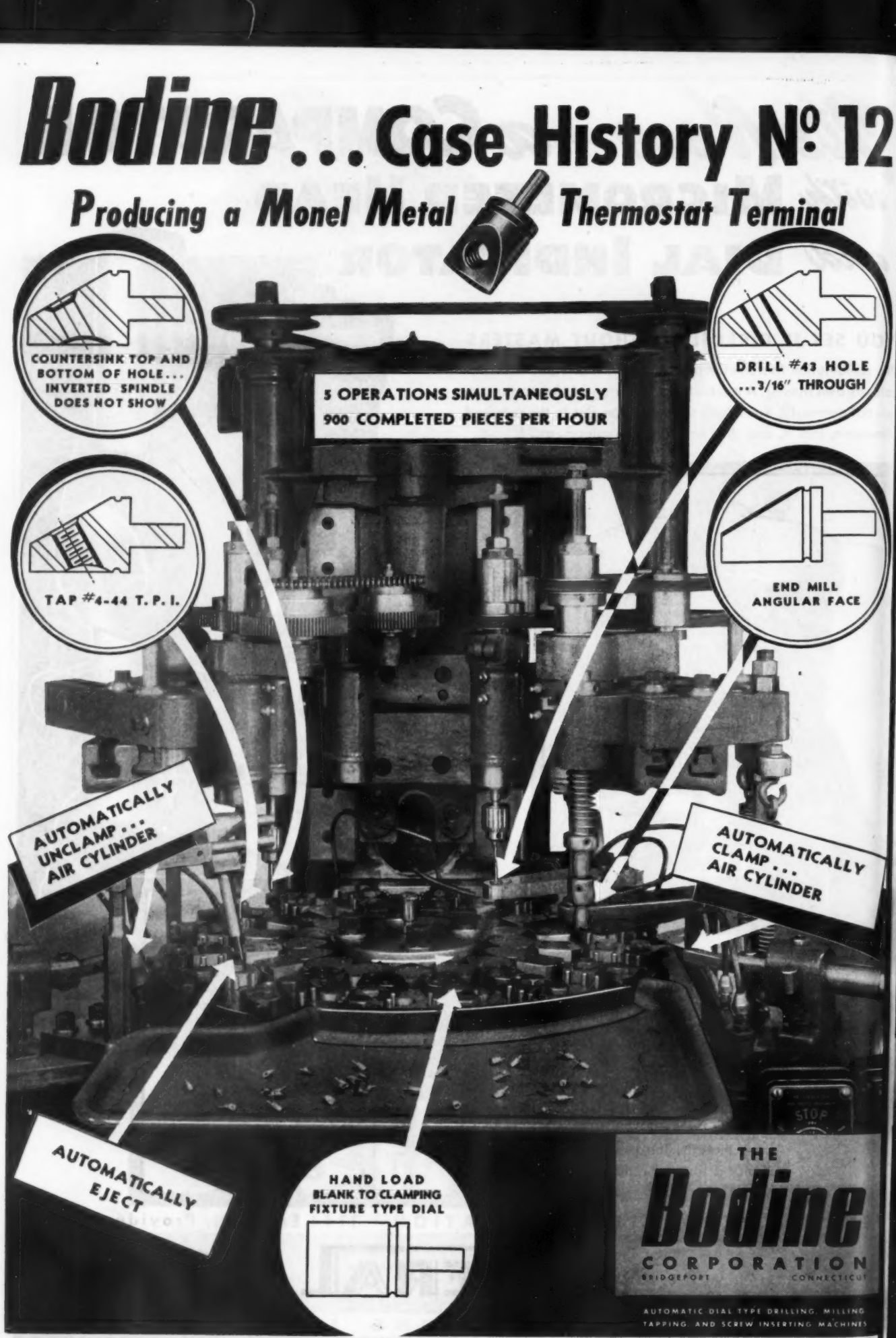
FEDERAL PRODUCTS CORPORATION · 1144 Eddy St., Providence, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

Bodine ... Case History No. 12

Producing a Monel Metal Thermostat Terminal


5 OPERATIONS SIMULTANEOUSLY
900 COMPLETED PIECES PER HOUR
AUTOMATICALLY UNCLAMP ... AIR CYLINDER
AUTOMATICALLY CLAMP ... AIR CYLINDER
AUTOMATICALLY EJECT
HAND LOAD BLANK TO CLAMPING FIXTURE TYPE DIAL
STOP

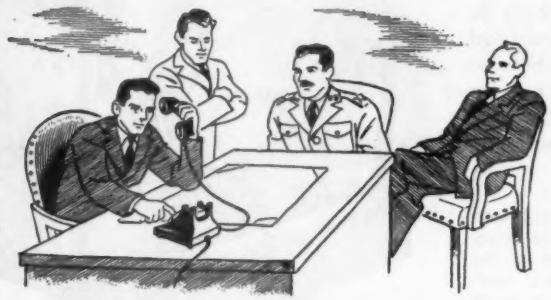
THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING AND SCREW INSERTING MACHINES

"SHOW-HOW"

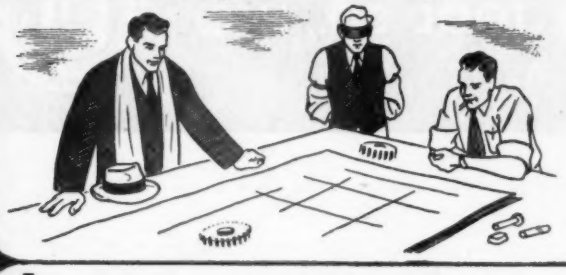
SHOW-HOW

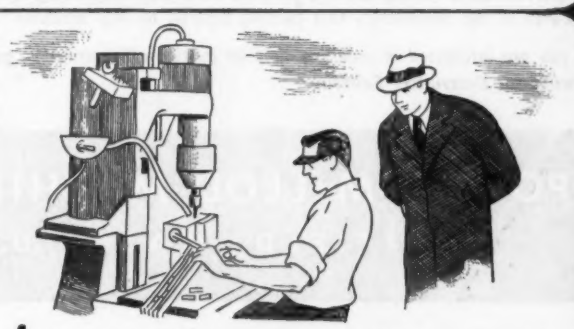
1 Leading U. S. company gets rush order for new complicated machine. Very secret. Calls "Greenfield" distributor regarding tools needed.



2 Distributor puts in hurry call for "Greenfield" man who arrives in less than two hours from nearby city. Sworn to secrecy, he is given a week to work out tool specifications for 123 tapping operations.

3 At customer's plant, "Greenfield" man studies blueprints, talks with engineers, makes notes. Finds that 123 tapping operations involve five different materials—carbon steel, alloy steel, bronze, aluminum and magnesium.

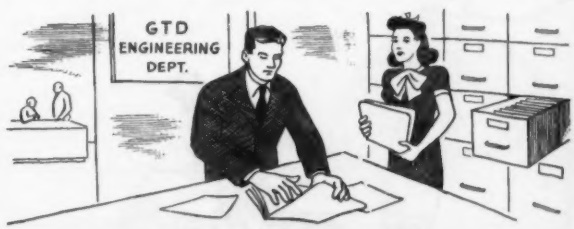




4 Next he studies machines available in customer's plant . . . notes sizes and styles . . . discusses production angles with shop engineers.

5 "Greenfield" man then prepares complete specifications for tap recommended for each of the 123 tapping operations, indicating material to be tapped and machine to be used.

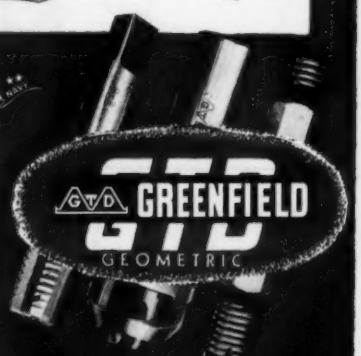
6 Just to make sure, he calls "Greenfield" home office to check several of his recommendations with case histories contained in "Greenfield's" huge experience file, makes necessary changes and submits finished report . . . *all in four days!*



Results! (1) "Greenfield Man" completed survey on the spot in four days instead of week. . . (2) Complete recommendations for tapping setup and tools were accepted as submitted. . . (3) New, highly restricted war product got into production without the delay of experimenting on tapping operations.

"Greenfield" SHOW-HOW is KNOW-HOW in action!

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!



NESTED MATERIAL IS SECURELY HELD UNDER HEAVY CUTS ON THE

PORTER-McLEOD COLD METAL SAWING MACHINE

Ability to cut stock from 3 inches up, to nest and hold bars or shapes securely for multiple cutting, combined with a standard feed of 3" per minute enable this modern, sturdy, clean-lined machine to make big savings in cutting-off time. A wide range of work can be handled by the 8" Porter-McLeod because of its capacity for 8" round or 7½" square stock. All cuts are accurately and cleanly made at highest speeds.

Truly high production is assured by unique features of design coupled with ample power. The blade is pulled upward through the stock, the blade being supported in such a way as to prevent buckling or weaving. Protection of the blade against hard spots in the stock being cut is provided by a friction disc feed. The Porter-McLeod blades are designed so that every tooth cuts, a feature which contributes to the remarkably fast cutting assured by this machine.

If you are interested in reducing time on cutting-off operations, get all details at once. Anyway, write for Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U.S.A.

MACHINE TOOL COMPANY

WHERE THE ARMS OF WAR ORIGINATE

MACHINE TOOLS form the basis for a war production program. An untold number of precision drilling operations must be performed to produce superior fighting equipment. And in the tooling for this war Sibley Drilling Machines have played an important part.

SIBLEY

MACHINE & FOUNDRY CORPORATION
SOUTH BEND 23, INDIANA

3 STARS IN THE FLAG . . . 37 IN THE FIELD

By the 3 stars added to our E flag you can be sure of continued high quality and high production in VARD gages, taps and calipers. By the 37 star distributors shown below, you can be certain of quick, intelligent service in meeting all your needs.

BIRMINGHAM, ALA.
Tool Engineering Service

LOS ANGELES, CALIF.
Machinists' Tool & Supply Co.

SAN FRANCISCO, CALIF.
Douglas & Sturgess

DENVER, COLORADO
Johnson Supply Co.

BRIDGEPORT, CONN.
Ward-Nagel Tool Supply Co., Inc.

ATLANTA, GA.
Fulton Supply Co.

CHICAGO, ILL.
Engis Equipment Co.

INDIANAPOLIS, IND.
Daco Tool & Engineering Co.

DES MOINES, IOWA
Globe Mchy. & Supply Co.

WICHITA, KANSAS
White Star Mchy. & Supply Co., Inc.

NEW ORLEANS, LA.
Murray-Baker-Frederic, Inc.

WORCESTER, MASS.
Ramsdell Industrial Supply Company

DETROIT, MICH.
B. A. Taylor Company

MINNEAPOLIS, MINN.
The John C. Eide Co.

KANSAS CITY, MO.
Fred A. Ellfeldt Co.

ST. LOUIS, MO.
Mill Supply & Mchy. Co.

OMAHA, NEBRASKA
Interstate Mchy. & Supply

NEW YORK, N. Y.
Walter D. Briggs Co.

ROCHESTER, N. Y.
The Sidney B. Roby Co.

SYRACUSE, N. Y.
Syracuse Supply Co.

CINCINNATI, OHIO
The Bingham Tool & Supply Co.

COLUMBUS, OHIO
Smith Bros. Hardware Co.

TOLEDO, OHIO
Klatt & Wood Machinery

OKLAHOMA CITY, OKLA.
Hart Industrial Supply Co.

TULSA, OKLAHOMA
Hart Industrial Supply Co.

PORTLAND, ORE.
The General Tool Co.

PHILADELPHIA, PA.
Carlin & Company

PITTSBURGH, PA.
A. D. "Bert" Sutherland

YANKTON, S. D.
Dakota Supply Company

MEMPHIS, TENN.
Hays Machine Tool Co.

DALLAS, TEXAS
United Tool & Supply Co.

HOUSTON, TEXAS
Huge-Fayle Supply Co.

SALT LAKE CITY, UTAH
Industrial Supply Co.

SEATTLE, WASH.
Campbell Hardware & Supply Co.

SPOKANE, WASH.
W. R. Matthews Mchy.

MILWAUKEE, WISC.
Triplex Supply Co.

VANCOUVER, B. C.
Hall Equipment & Products Ltd.

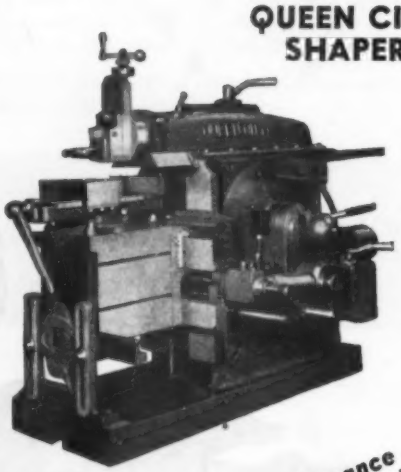
VARD INC.

PASADENA 8, CALIF.

20% LOWER IN PRICE

The NEW 20" Super Twenty

QUEEN CITY SHAPER



Better Performance . . . New Economy!

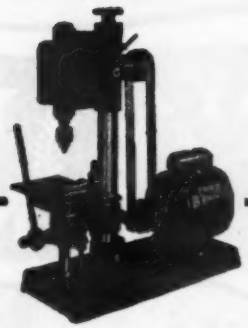
The new Queen City Super 20" Shaper is not only an important development in shaper design and performance—this fine new machine is actually 20% lower in cost than any machine of its type.

An extremely versatile feed range—from .008" to .191"—makes this shaper equally suited for heavy hogging or close tolerance tool room work. Feed changes are made easily. The clutch requires minimum attention and adjustment. The ram is the V-type wide bearing, bottom and sides. Many other features, including a high torque motor and convenient switch controls, make this shaper a superior buy. Timken bearings are used throughout.

Write for full details regarding features and specifications.

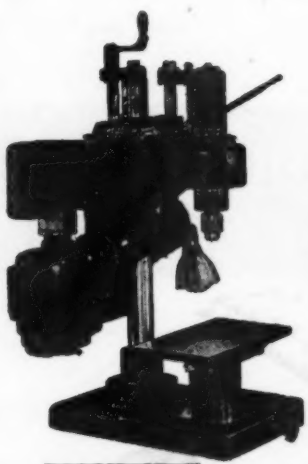
Agents in Principal Cities

QUEEN CITY
MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO



HAMILTON MUEHLMATT SENSITIVE TAPPER

A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

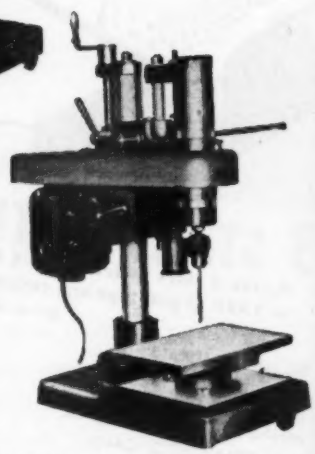


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 8,750 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

Write for full particulars on any or all of the machines shown.

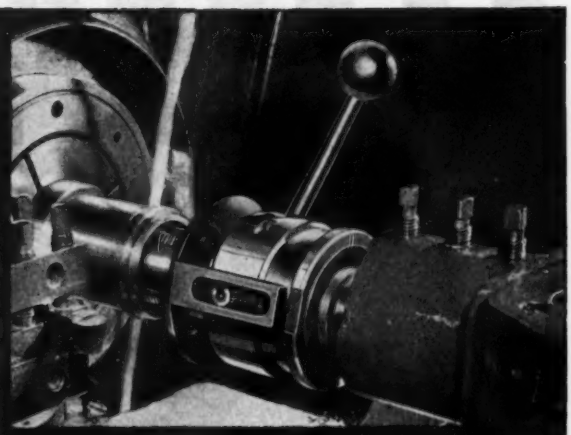
The Hamilton Tool Co.
830 NINTH ST. HAMILTON, OHIO

You can get **MOR**

from the **GEOM**

CLA

COLLAPSING



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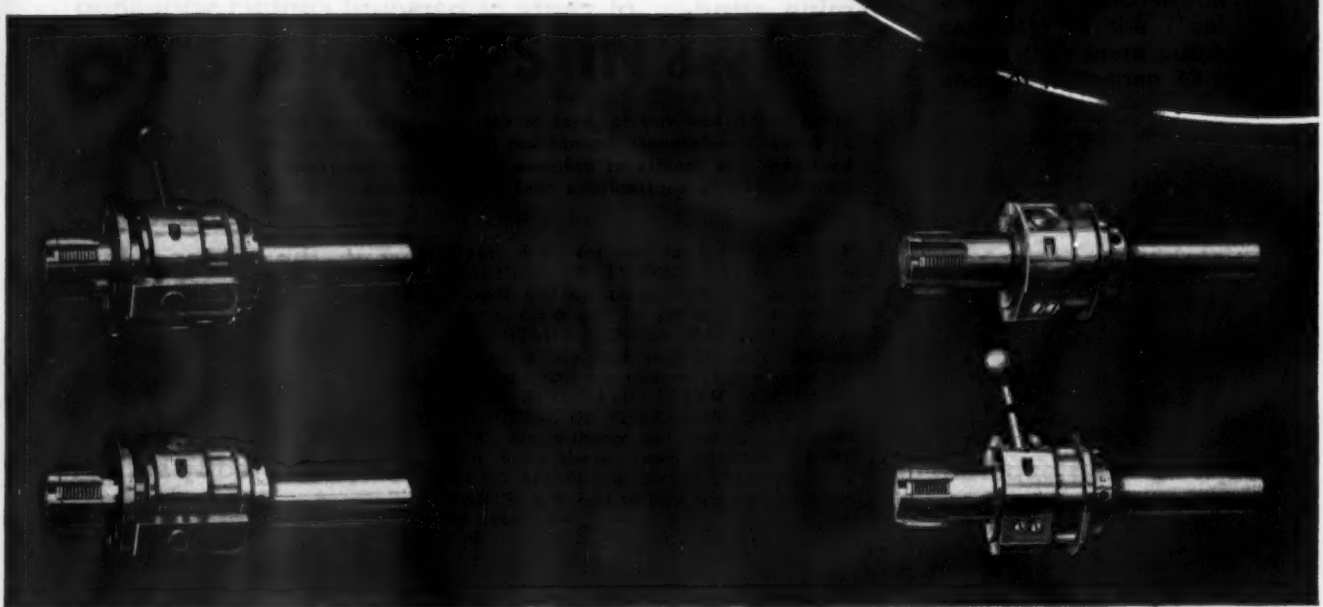

THE GEOMETRIC TOOL COMPANY

NEW HAVEN 15, CONNECTICUT

ARMY E NAVY

SAFETY
GRINDING WHEELS

Yes—EVEN FOR THE JOB THAT'S DIFFERENT!

Maybe yours is just run-o'mine grinding. Or again, you may require precision grinding. Whatever the nature of your grinding operation, remember that in the extensive SAFETY line of Grinding Wheels there's a correct combination of grain, grade, porosity, and wheel size that, in effect, is made specially to your order for the work you have to do.

That's a result of many years of specializing experimentation on grinding wheel design and construction—of years of personal contact with shop operators, foremen and superintendents learning at first hand their grinding problems, and developing the "know-how" to solve these problems.

So even if your grinding requirements are different, the chances are that SAFETY Grinding Wheels have much to offer that you are not now getting in greater output and lower cost of better grinding. We'd like to tell you more. Drop us a line today stating the kind of work you do.

SAFETY GRINDING WHEEL AND MACHINE COMPANY

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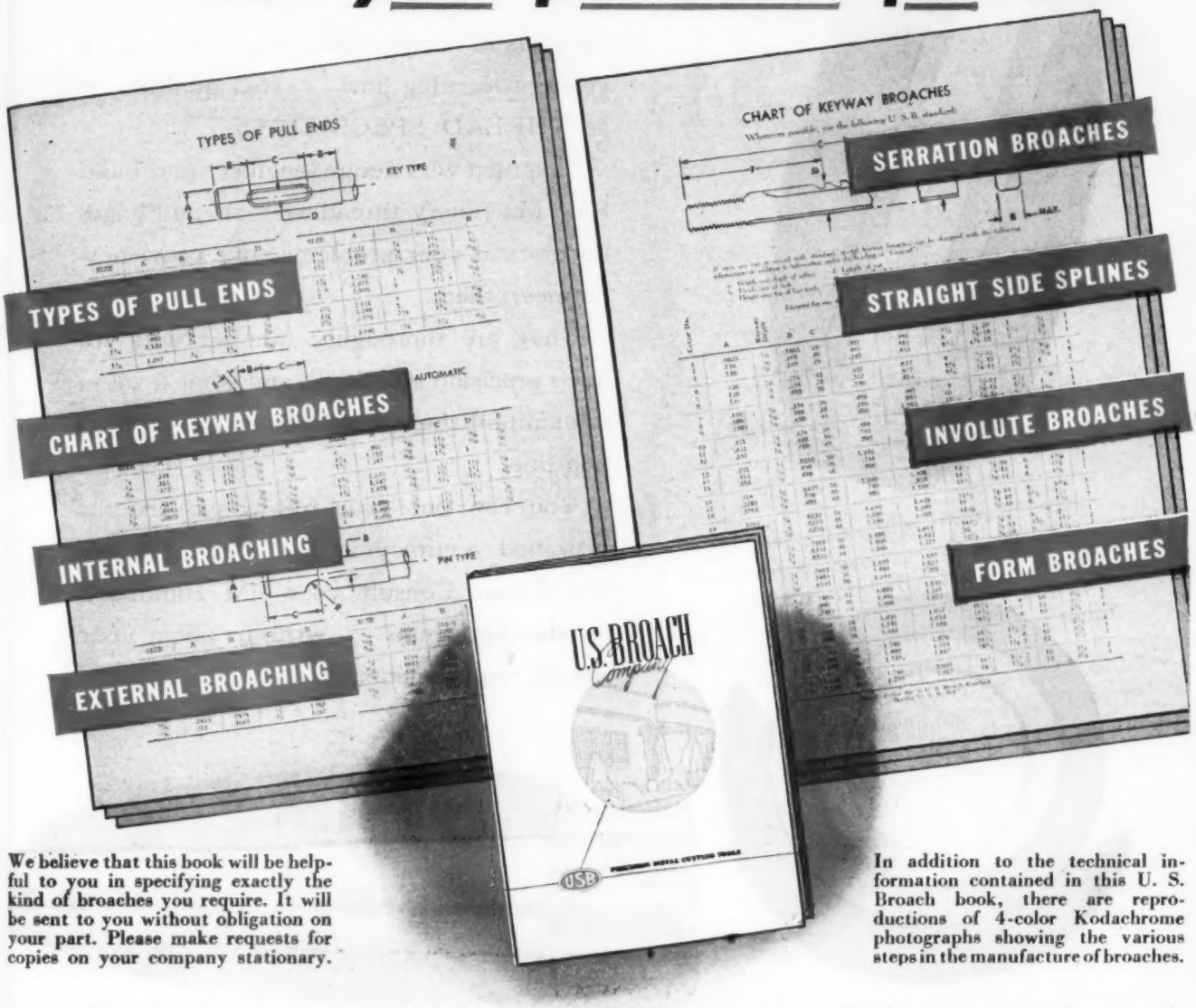
INFORMATION

that will help you..

get the best possible broach for *your particular job*



We believe that this book will be helpful to you in specifying exactly the kind of broaches you require. It will be sent to you without obligation on your part. Please make requests for copies on your company stationary.

In addition to the technical information contained in this U. S. Broach book, there are reproductions of 4-color Kodachrome photographs showing the various steps in the manufacture of broaches.

★ *We manufacture broaches, broaching fixtures, broach holders, splined gages and arbors* ★

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for 32 Years of experience as

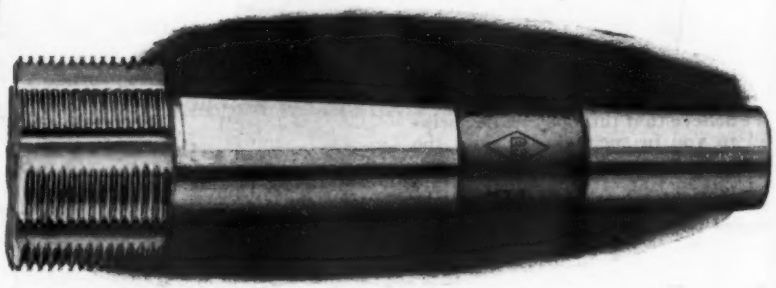
Thread Specialists

32 years of accumulated experience . . . 32 years of learning how . . . that qualifies us as THREAD SPECIALISTS.

The men who design, engineer and build Pipe Machinery threading tools and gages understand your problems, and know how to meet them.

They are thoroughly familiar with today's precision standards, and what it takes to maintain these standards on the production line.

You can put your full confidence for sustained accuracy in PM Cutting Tools and Gages. Consult your PM Handbook for standard items . . . write us about your special requirements.



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The PIPE MACHINERY COMPANY Cleveland, O.

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A new time-saving, cost-saving device for the precision cutting of internal grooves in bores or housings.

● The new Waldes Truarc Internal Grooving Tool banishes many of the problems and annoyances of internal groove cutting and makes it one of the simplest operations in your shop!

● Can be used in any automatic or hand drilling or reaming machines; it assures a concentric recess, without scratching or maiming. Because it operates by fingertip pressure, it is especially suitable for female workers. Skill is not a factor.

● A descriptive brochure, giving all mechanical details, cutting sizes and features is available. Just write:

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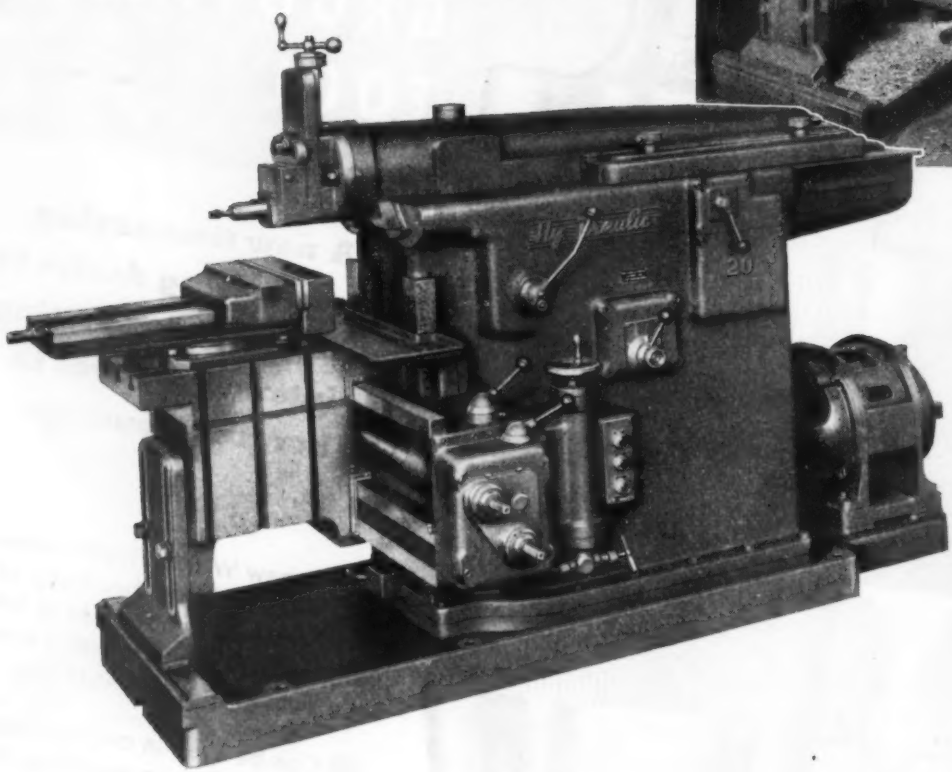
You Couldn't Beat that Baby"

SAID PAUL AT S & B TOOL CO.

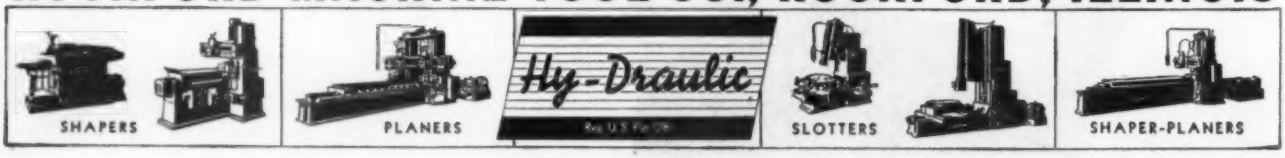


BUY UNITED STATES WAR BONDS AND STAMPS

The "baby" is one of the Hy-Draulic Shapers in the plant of the S & B Tool Co. where Paul is foreman. By way of proof, Paul put the Hy-Draulic Shaper through its paces for the visitors and their camera. Easy set up was demonstrated by use of centralized controls, rapid traverses; quick, easy establishment of desired cutting speed and feed, setting ram-stroke length and position in one simple manual operation with hardly a pause in its movement. In less time than it takes to describe, chips rolled off the job and Paul stood at ease ready for the next operation. In shops like this, where fine work is put out around the clock seven days a week steadily month after month, the easy, fast operation, accuracy and stamina of Hy-Draulic Shapers pay off in high production and economy of effort. For present and future tool and die work, maintenance or production operations that include shaping — buy Hy-Draulic Shapers. Write to us today, for Bulletin 1120.

4411

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



First there was 1 STANDARD

Now there are 3

STANDARD (Regular) | FINE-TEX (Fine) | TUFF-TEX (Tough)

For **WIDER VERSATILITY**
GREATER TIME SAVINGS

Rubber-Cushioned Brightboy TEXTURES

BRIGHTBOY TUFF-TEX

Tougher texture, for finishing hard metals. The tougher binder accents the abrasive action, yet retains the soft rubber cushion, finishing and polishing in one operation.

BRIGHTBOY STANDARD

Brightboy STANDARD texture is a favorite for burring, finishing and polishing on the widest variety of metals and metal parts.

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Smoother, finer texture for work on softer metals, producing special finishes and for applications where the coarser wheel might not be suitable.

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BURRING
FINISHING
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Brightboy's binder of *rubber* gives a resilient "cushioning" to the action of the abrasive. . . .

—a *smoothing, cleaning, one-operation action* that replaces time-taking grind-to-buff production steps; a finish that often constitutes the *final polish.*

Brightboy's service representatives will gladly show you how to widen your versatility, save your time, in abrasive finishing. Brightboy distributors will gladly give you prices, catalogs, methods and applications data. *Write*—

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark 7, N. J.

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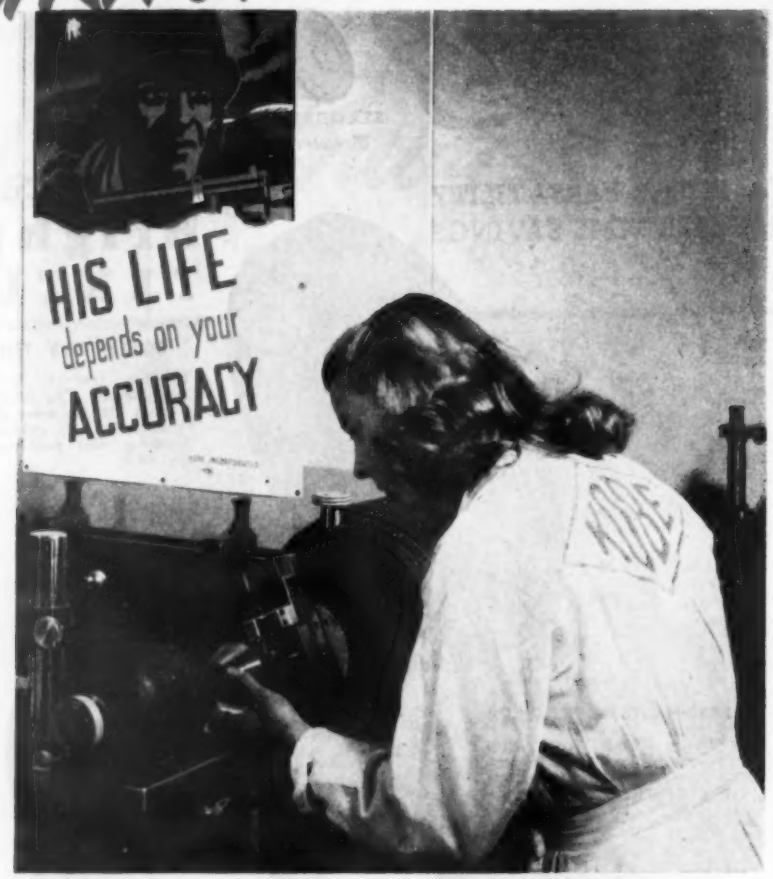
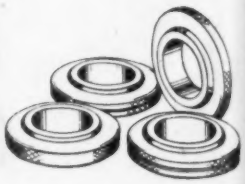
Accuracy is our Watchword





There can be No Margin for Error

A second chance?

How many of our boys on the battle-fronts would have liked just that when a breech lock stuck, landing gear jammed, engines quit or countless other things went haywire at a crucial moment in this mechanized war.

There can be no margin for error in equipment produced for our Armed Forces. Kobe personnel live this slogan.

Here at Kobe we make gages. And it's our business to make 'em right. Equipment checked with Kobe gages doesn't fail through fault of fit or precision finish: Accuracy is our watchword—and our business. We know that the gage Bill started yesterday, that Bob finished last night might well spell the difference between life and death. The poster illustrated above is one way we keep before us day and night the importance of our job.

Yes, this war has taught us a lot. How big things tick because attention was paid to little things. How attention to detail pays off in men's lives. That's why, after the war, we will go on making accuracy our watchword so that industry will be equipped with good tools for the big peacetime job ahead.

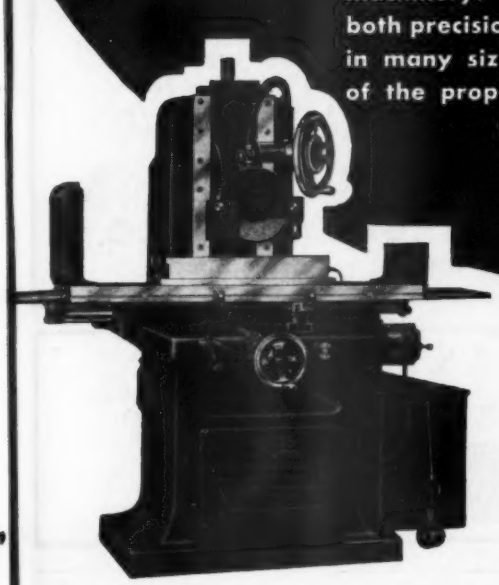
KOBE

Master and Reference **GAGES**

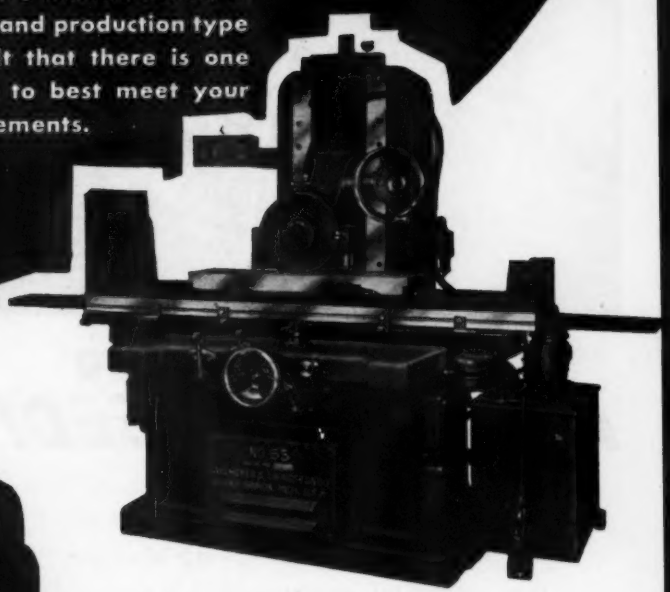
KOBE, INCORPORATED
3040 East Slauson Avenue • Huntington Park, California

GRAND RAPIDS
HYDRAULIC FEED SURFACE
Grinders

GALLMEYER & LIVINGSTON COMPANY is today building what is without question the finest, smoothest, and fastest Hydraulic Feed Surface Grinders of their entire career — a direct result of over 35 years of experience in the design and production of high grade precision grinding machinery. These machines are manufactured in both precision tool room type and production type in many sizes with the result that there is one of the proper size and type to best meet your particular requirements.



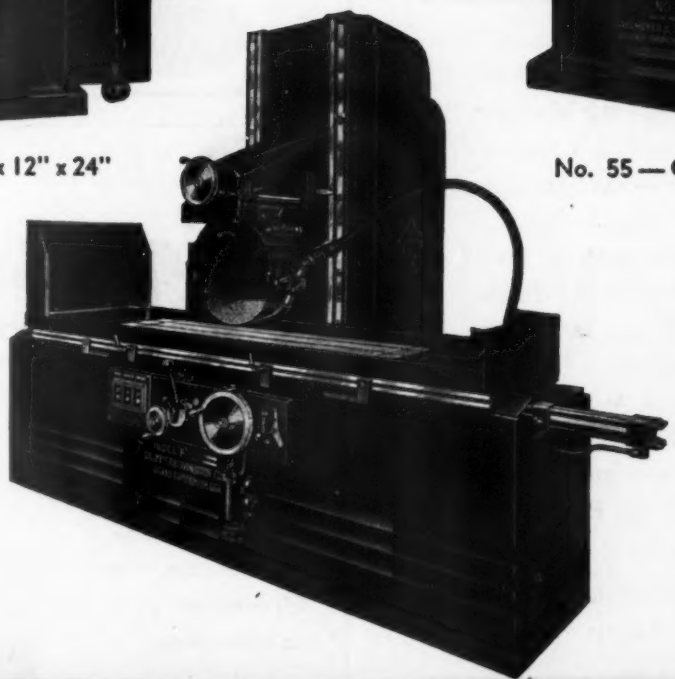
No. 35 — Capacity 8" x 12" x 24"



No. 55 — Capacity 12" x 17" x 36"

Precision Tool Room Type Machines

This is the type of GRAND RAPIDS Hydraulic Feed Surface Grinder on which one prominent machine tool builder obtains a 5 micro inch finish operating machine at 125 feet per minute. They are illustrated and described in bulletin GL-100.



Production Machines

GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders manufactured by the GALLMEYER & LIVINGSTON COMPANY are designated as Model F and Model A and feature the use of wide faced wheel and cross traveling head. GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders are illustrated and described in bulletin GL-4-1-43. Write for your copy today.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE. S. W.

GRAND RAPIDS, MICHIGAN

Permits Amazing Accuracy + SPEED!

PLUG the leak in your "cutting off" costs! Use the new high speed Peerless Mechani-Cut Metal Sawing Machine for cutting off operations! It's fast — saws to close tolerances — cuts straight as a die! Exclusive Peerless design . . . new Mechani-Cut Compensating Feed Unit, Four-Sided Saw-Frame and Blade Backing-Plate will save you money in faster, more accurate sawing.

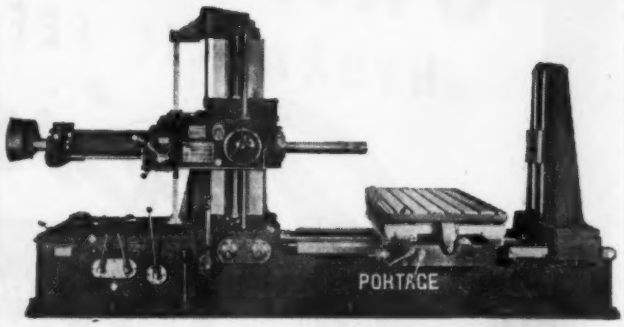
These precision-built Mechani-Cut Saws are available in 7", 11", and 14" capacities. Make sure you aren't overlooking a good bet! Write Peerless or call your local dealer today!

DEALERS IN ALL PRINCIPAL CITIES

Write Department AM-345

PEERLESS
MACHINE COMPANY
RACINE · WISCONSIN

PORTAGE



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• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

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Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
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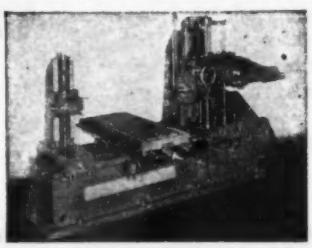
UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

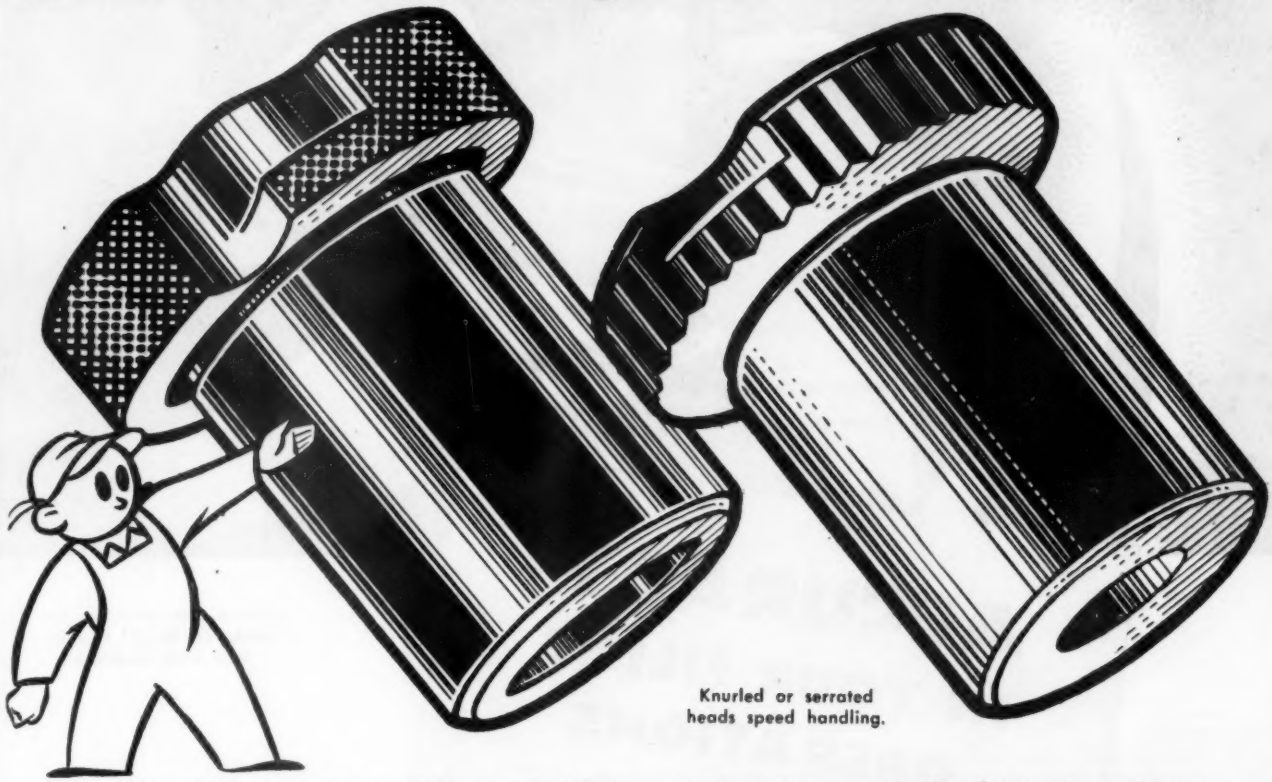
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

Universal Drill Bushings Save Drills and Tools

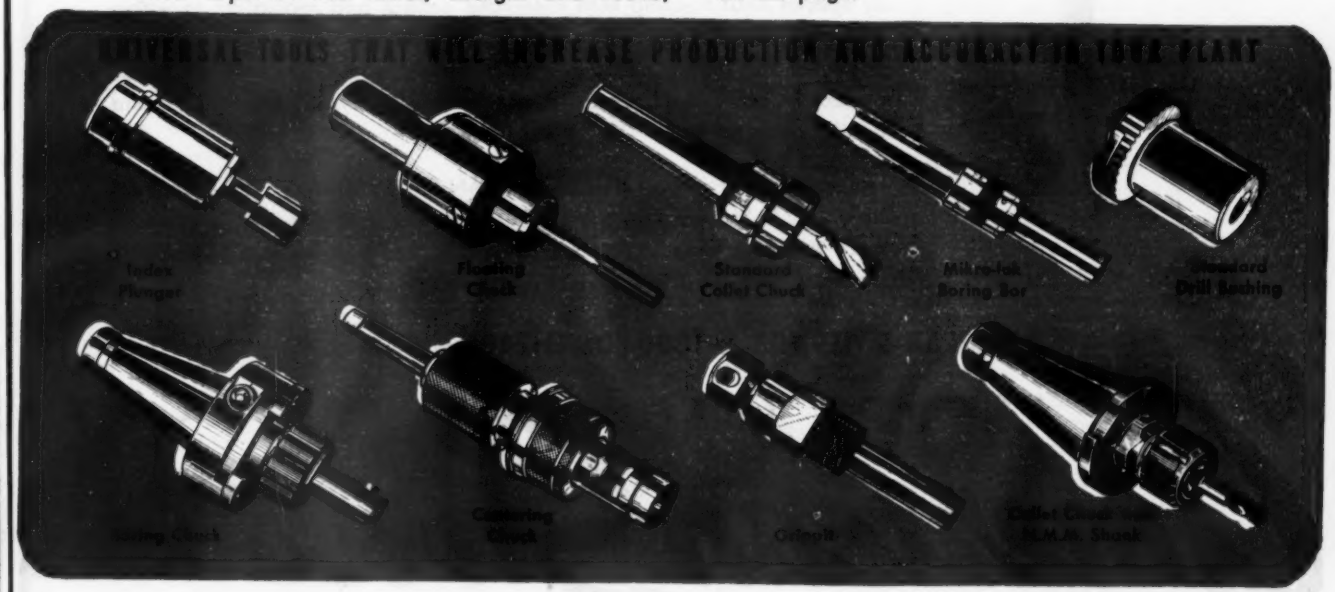


Knurled or serrated heads speed handling.

Back in 1919 W. R. Fisher of the Universal Engineering Co. originated the idea of standard drill bushings. Today, 26 years later, these bushings are saving countless manufacturers thousands of dollars by reducing drill-breakage and insuring more accurate drill, ream, and tap work.

Universal drill bushings are made of hardened, high quality steel with unexcelled resistance to wear through friction and galls caused by chips. Their super-finished bores, straight and round, guide tools accurately. Knurled heads speed insertion in and removal from jigs.

Universal drill bushings are made to the exacting standards of fine workmanship which has made the Universal Engineering Company a leader in the production of quality tools. Write today for complete information on Universal drill bushings, Mikro-lok boring bars, standard collet chucks, or any of the other superior Universal tools illustrated on this page.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

2

ACCURACY IN YOUR FILING OPERATIONS

2nd of a series describing how "AMERICAN SWISS" Files improve filing operations

"AMERICAN SWISS" Swiss-Pattern Files are made as closely to size as humanly possible . . . with a tolerance of ±.002 in. in many shapes. That's one reason why these precision tools assure ACCURACY in your filing operations. Another reason is their uniform hardness . . . assured by special heat treating with automatic control and regulation to within ± 5 deg. Fahr. Furthermore, every "AMERICAN SWISS" file is rigidly inspected for shape, cut, size and hardness, and GUARANTEED to be perfect in every respect . . . for "AMERICAN SWISS" has no "second quality" files for sale.

No wonder users report that "AMERICAN SWISS" files are more dependable . . . hold their edges longer . . . save time and money . . . assure more accurate filing. Write for catalog today, and make a selection to purchase from our Distributor in your territory.

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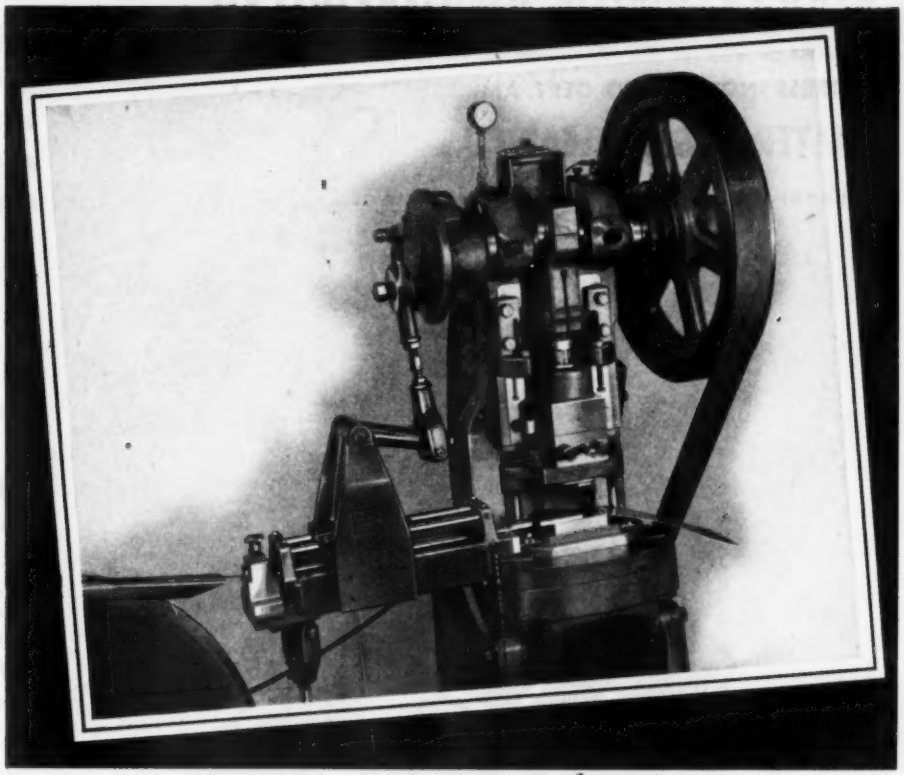
American Swiss

SWISS PATTERN FILES

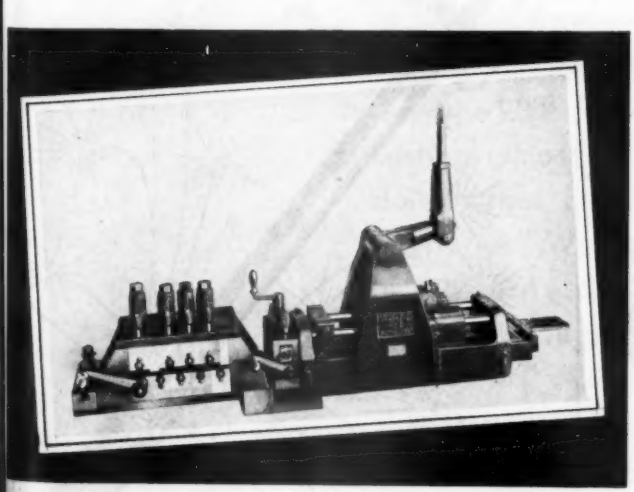
Accuracy PLUS Speed!

the formula for successful production!



Today's production demands call for speed and still more speed. However, on the majority of jobs accuracy is still the keynote. In other words, accuracy cannot be sacrificed for speed alone.

Punch press jobs calling for both speed and accuracy are made to order for the U. S. Slide Feeds. These Feeds are designed for feeding material from coils into punch press dies, and the conventional method for mounting is on the left hand side of the press for push feeding the material from left to right. The photograph shown at the right illustrates a typical set-up. For other directions of feeding (front to back, back to front and, in some instances, right to left) special connections are required.



The U. S. Slide Feeds are generally recognized as the most accurate automatic Feeds on the market for feeding coil stock into a punch press. The feed block (containing the feed slide which grips the material on the forward stroke) reciprocates on hardened slide rods between adjustable stops to definitely control the length of feed. Initial adjustment for feed length is accomplished by means of the eccentric which is mounted on the extension of the press crankshaft. After set-up and correct adjustment, no further attention on the part of the operator is required and the feed converts the press into an entirely automatically operating unit. On most jobs the Feed operates at the maximum press speed.

Many job requirements necessitate the elimination of the "coil-set" from the material before it enters the die. For this class of work the combination of the U. S. Slide Feed and the positive-action U. S. Plain Stock Straightener is the idea set-up. As illustrated at the left, these can be mounted together as a single unit to perform with extreme accuracy at high speeds.

Both the U. S. Slide Feed and the U. S. Plain Straightener are made in a range of sizes to accommodate various feed lengths and widths of stock. Bulletin 50A contains complete specifications. Also included in the Bulletin are descriptions and specifications of the U. S. Plain Stock Reels for holding coils of material. Write for your copy—there's no obligation.

U. S. TOOL COMPANY, INC.
AMPERE (EAST ORANGE), N. J.

BUILDERS OF U.S. MULTI SLIDES — U.S. MULTI MILLERS — U.S. AUTOMATIC PRESS ROOM EQUIPMENT—U.S. DIE SETS AND ACCESSORIES

Remove Embedded Taps, Drills and Studs

DRAFTO METAL DISINTEGRATOR

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WALTER J. GREENLEAF CO.,

National Distributors, Pittsburgh, 21, Penn'a.

Apparently no metal having electrical conductivity is too hard for the Drafto Metal Disintegrator. By means of a vibrating arc the Drafto Metal Disintegrator will

1. Remove broken taps
2. Remove broken drills
3. Remove hardened studs
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5. Disintegrate holes in Tungsten Carbide
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**** and other uses are being developed daily

Drafto Metal Disintegrator operates without excessive heat, and without damage to finished surfaces.

The Drafto Metal Disintegrator is complete with coolant tank and pump, and a supply of electrodes. It's ready to go to work for you, at once, saving pieces you formerly scrapped, saving time, money and materials. Write for bulletins and details. Manufactured by Drafto Corporation, Cochranton, Penna.

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USE DRAFTO COOLANT TO ASSIST DISINTEGRATION

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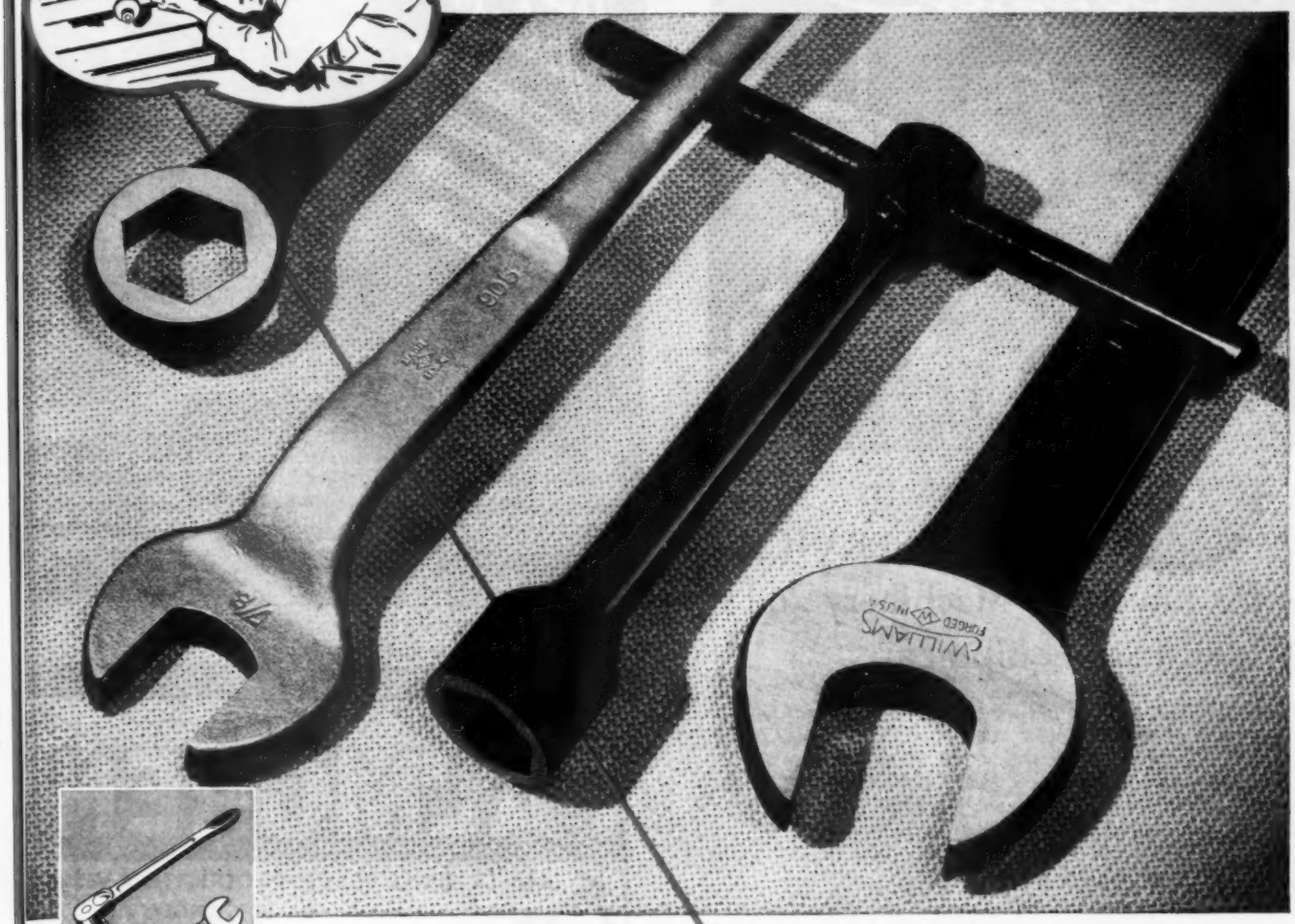
WILLIAMS' *Superior* CARBON STEEL WRENCHES



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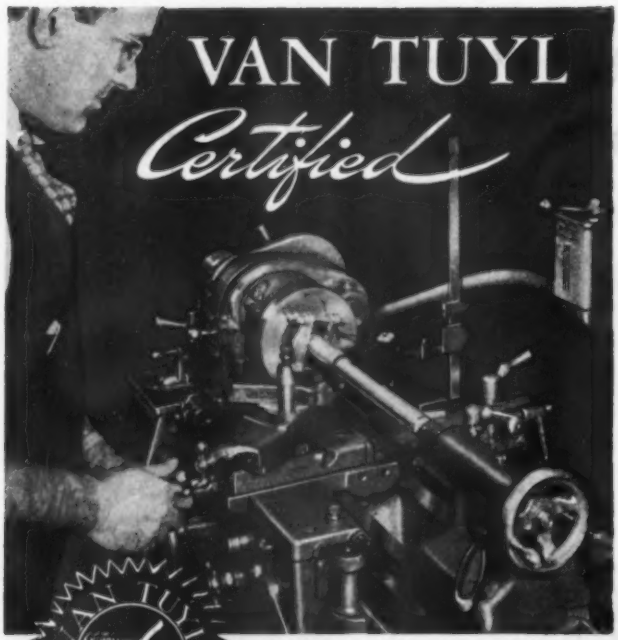
● Forged from carbon steel, specially-processed to exacting specifications, Williams' "Superior" Wrenches average 93% as strong as corresponding alloy wrenches costing almost twice as much. Their strength is almost double that of old-fashioned carbon steel wrenches. "Superior" Wrenches are available in a wide range of patterns and sizes. Sold by leading Industrial Distributors everywhere.

J. H. WILLIAMS & CO.,
Buffalo 7, New York.

WILLIAMS
DROP-FORGINGS AND DROP-FORGED TOOLS



Above: Alignment test, one of thirty detailed machine condition checks.

A NEW SERVICE for buyers of Machinery and Industrial Equipment

TO SAFEGUARD the interests of the purchaser of machinery and industrial equipment Van Tuyl Engineering Corporation offers an independent inspection service. Every detail is checked to assure the client that:

—specifications are met precisely;
—valuation is as stated by seller;
—equipment is mechanically complete or deviation noted.

And . . .

—if equipment meets the rigid Van Tuyl Engineering standards, it is so Certified.

In addition, Van Tuyl Engineering will, if desired, estimate the cost of reconditioning; see that packing meets foreign importers' requirements; estimate cost and supervise installation at destination, advise as to type of equipment best suited for contemplated production; and furnish comprehensive plant and initial production engineering.

With a large staff of engineers, specialists in every branch of engineering for industry, Van Tuyl Engineering Corporation maintains offices in Detroit, Los Angeles, Mexico City, and has field engineers in every major industrial center in the United States. Participation in the high production records of leading American aircraft, armament and automotive manufacturers notably qualifies this organization to serve the best interests of buyers of both used and new machinery and other industrial equipment. Inquiries by responsible firms are invited and will be answered in full.

Buy with Confidence on Van Tuyl Certification

VAN TUYL ENGINEERING CORPORATION

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REID for precision plus!

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DURABILITY
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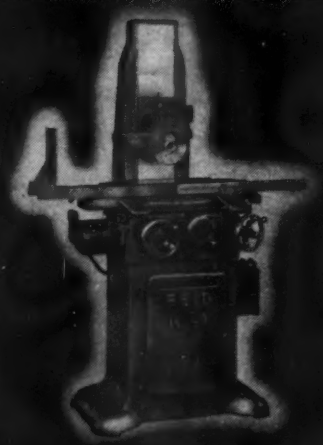


REID SURFACE GRINDERS are of heavy, rigid *stress-proof construction* for smoother work finish.

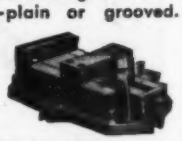
Centralized controls assure ease of operation - - - - simple, well balanced *design* for longer care-free duty. Whether for precision production work or tool room precision work REID GRINDERS are built to do the job *RIGHT!* - - - - - - - - - - Send for catalog and price list today.

REID BROTHERS COMPANY, INCORPORATED
BEVERLY, MASSACHUSETTS

PALMGREN

ANGLE—DRILL PRESS—PRODUCTION VISES

No. 000 ANGLE VISE
Mounted on Swivel "M" Base
For Drilling, Milling, Grinding, Filing, Fitting, Etc. Permits setting up of angle work accurately and quickly without clamps, wedges or make-shift methods. Accurately graduated for all angles, once set it stays locked. Precision machined of semi-steel casting. Jaws are hardened steel—plain or grooved. Sizes 1½" to 8".



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For fast, heavy work. Adjustable cam locking lever. Movable jaws, hardened and ground. Sizes 3" to 8" Jaws.

FLANGED MILLING MACHINE VISE
Clamps to table of milling machine, grinder, etc. For heavy work. Has hardened and ground jaws 6" wide, 2" deep.

DRILL PRESS VISES
For every purpose. Accurately machined, best semi-steel castings. Long bearing adjusting screw. Jaws hardened steel—plain or grooved. Sizes 1½" to 4".

No. 250 MILLING ATTACHMENT VISE
MAKES MILLING OPERATIONS POSSIBLE ON LATHE

A necessary fixture for small shops and emergency work in large shops. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical angle adjustments. Easily mounted on cross slide and held by one T-Slot bolt. PALMGREN VISE has 2½" Jaws opening full 2½". Depth Jaw 1-7/16", one plain and one grooved jaw for holding round pieces. Height 10½", Price $24.75.

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RIGHT... down the line in types and sizes

You'll find all types and sizes of Bay State Grinding Wheels for all types of work ... RIGHT, down the line. Centerless grinding, cylindrical grinding, disc grinding, internal grinding, snagging, cutting-off, etc. . . . Sizes, shapes, bonds, grades, grains, and structures to meet specific requirements right.

And once you have determined on a type and size that suit your job right, you can expect to get the very same qualities on repeat orders. "Top performance, consistently duplicated" results from extremely close control over materials and manufacturing processes plus such Bay State features as

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"Controlled Porosity" — a precise method of spacing cutting units which not only makes closer selection possible but also exact duplication.

Such a combination of features are your assurance of getting grinding wheels that are RIGHT — down the line. So whatever your needs for grinding wheels, look into the advantages offered by Bay State's complete line. Write for bulletin to get additional facts.

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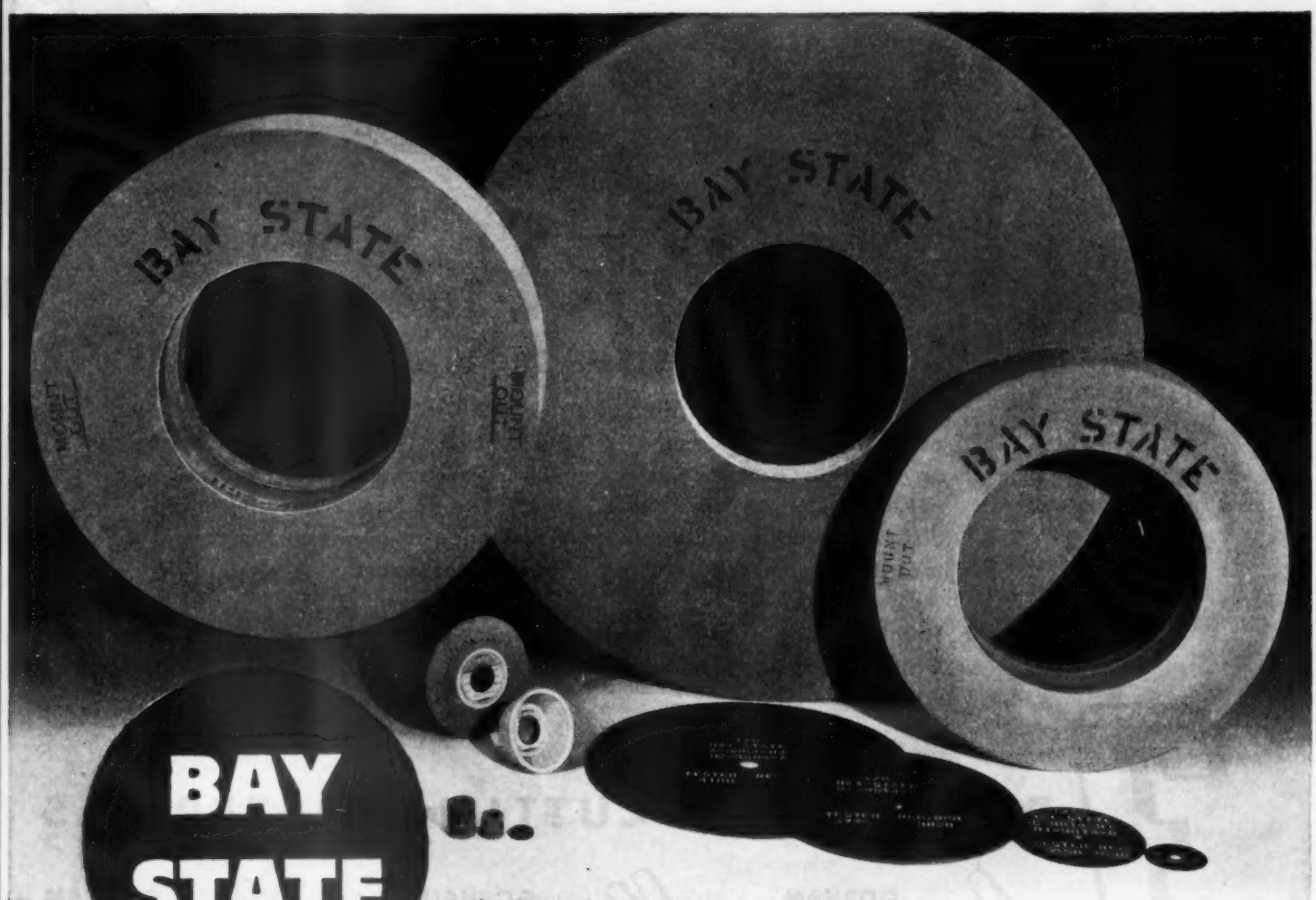
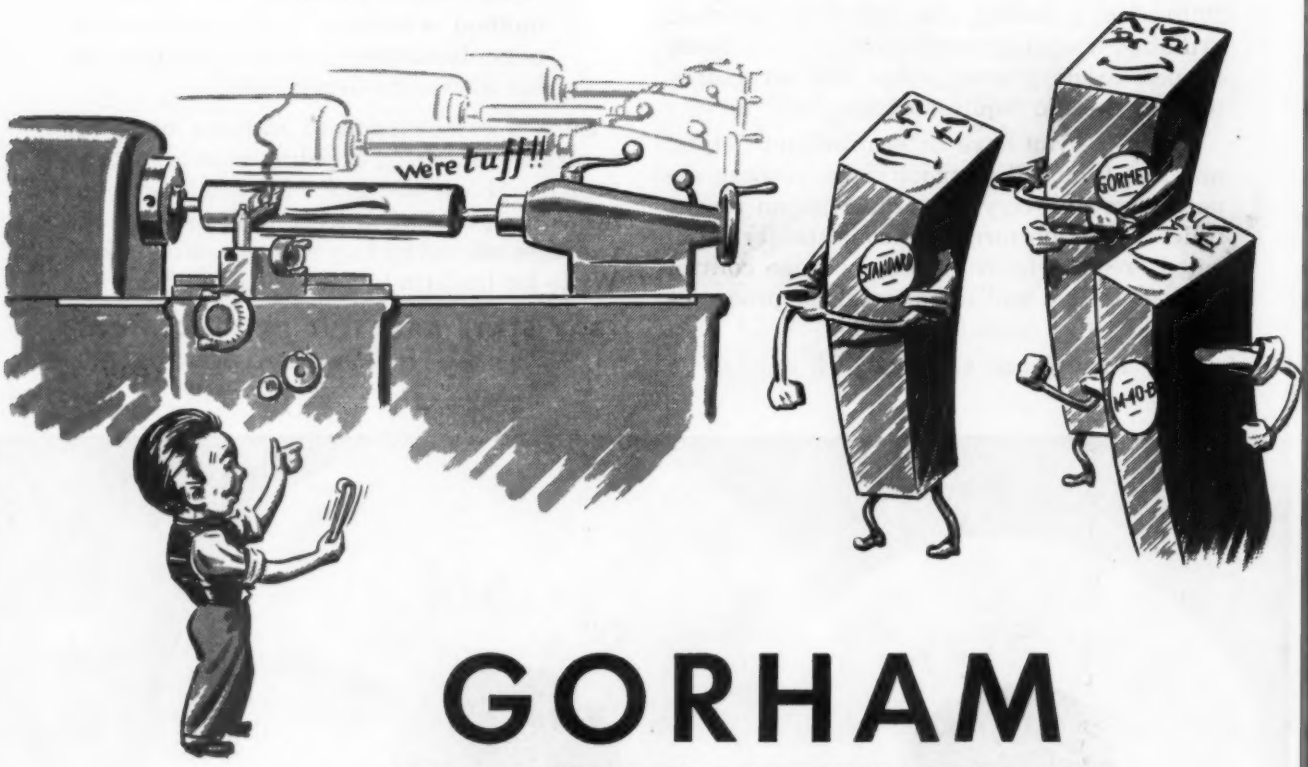


ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

...tough cutting jobs to lick?



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HIGH SPEED STEEL GROUND TOOL BITS

They welcome "tough nuts to crack"—this versatile Gorham family of superior quality Ground Tool Bits. . . They'll tackle and lick almost any cutting problem you can offer—because they're "trained" *specialists*. . . In other words, the Gorham family includes *three* distinctive cutting materials, each designed to give you the *correct* tools to do *specific* jobs *right* . . . and at least cost.

Tough cutting jobs—or ordinary ones—you'll find that Gorham Ground Tool Bits will take 'em in stride. . . Why not talk it over with us?

3 DISTINCTIVE CUTTING MATERIALS

GORHAM STANDARD
For the commercial field

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For heavy cuts in hard material

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For more abrasive materials

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Hard Facing Electrode

Well-drilling cable tool. Hard-faced with Colmonoy No. 1

Dipper teeth. Hard-faced with Colmonoy No. 1

ROCKWELL C 58-62

● Colmonoy No. 1 is both tough and shock resistant. It won't chip or break off when subjected to such terrific punishment as it gets on construction or digging equipment. It is a flux-coated, general purpose electrode particularly adaptable for building up relatively large sections of thick, hard-facing overlays.

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Colmonoy No. 1 is but one item in a complete line of alloys for every hard-facing need.

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COLMONOY NO. 1
Ferrous Hard-Facing Alloy. Specific gravity 7.70. Melting point, 2400° F. Approximate composition %: Cr. 7-11. B. 1-2. Si. 2-4. Fe. Bal. Very high wear and shock resistance. Non machinable.

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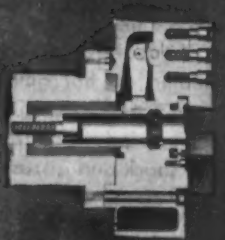
Chucking time reduced to seconds

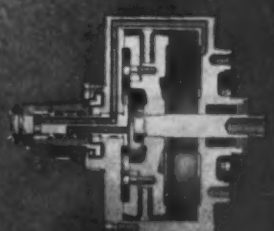
with LOGAN Air-Operated Chucks

on Foster Fastermatic Automatic Turret Lathes

Model 100 Logan air-operated universal chuck mounted on Foster turret lathe.



Cutaway view showing operation of efficient Logan chuck jaws.



Cutaway view showing Logan chuck mounted on Foster turret lathe.

Standard Logan air-operated chucks provide fast, accurate, positive chucking of parts —*in a matter of seconds*—on this job performed on two Foster "Fastermatic" automatic turret lathes.

The part, a hub reduction drive gear, is machined complete in two chuckings. The time and effort saved by means of the Logan equipment enable one woman operator to run both lathes and handle the entire job. Chuck jaws are quickly opened and closed by simply turning the lever of the air control valve. As a result, valuable operating and machine time is saved, production is increased, and hazards from improperly chucked workpieces are eliminated.

In addition, turning accuracy and finish are greatly improved because the unusually compact Logan chuck minimizes overhang, thus promoting rigidity and strength of the set-up. The constant, regulated pressure of the chuck jaws prevents distortion of the work.

Logan provides all of the equipment required for the complete chuck installation —standard 3-jaw universal chuck, rotating air cylinder, air control valve and accessories, all designed to operate together as a balanced chucking system. Standard chucks are also available in many other types and sizes, and special chucks can be supplied to meet unusual requirements.

For jobs where hydraulic actuation is desirable, the Logan line includes hydraulic operated chucks, hydraulic control valves and hydraulic power units.

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Logan

Air and Hydraulic Equipment

Write for new catalogs covering Logan chucks, air cylinders and accessories, hydraulic cylinders, hydraulic power units.

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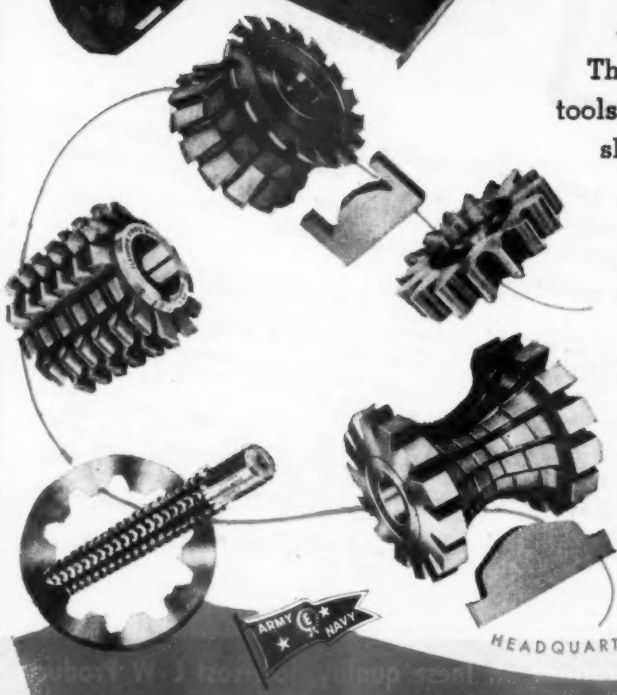
A VAST EXPERIENCE IS READY TO HELP SOLVE YOUR SPECIFIC PROBLEMS

Many metal cutting operations have peculiar conditions which are most efficiently met by tools especially engineered for the specific application. The new metals, new techniques and new machine tools coming into use call for outstanding engineering skill and experience to produce the proper tooling to take full advantage of their production possibilities. The engineers and metallurgists at Illinois Tool draw upon the knowledge gained through thirty-two years of practical experience solving tooling problems of major production industries to give you cutting tools engineered for increased efficiency and longer life.



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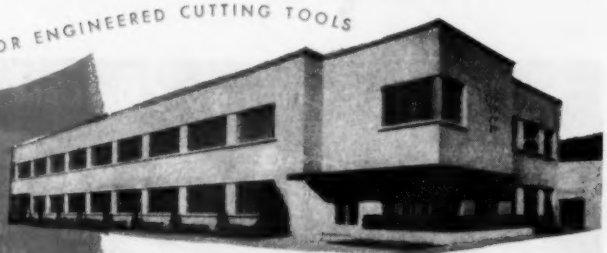

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Model AU-Full Universal for Complete Indexing and Spiral Cutting, $194.65

Model BP for Plain Milling Machine, $128.55

● Surprisingly low in price, yet built to high quality standards, the new I-W 11" Universal Dividing Heads offer utmost accuracy at a cost lower than any comparable equipment on the market. The unit is constructed with many new features to increase their accuracy and their use for practical, profitable shop work.

HEADSTOCK—New, ruggedly designed for maximum rigidity. Can be swiveled to any angle.

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HEADSTOCK SPINDLE—Tapered bearings, bored for No. 10 B & S Taper. Increased diameter and length. Threaded nose, 2¼" diameter 10 thread USS.

WORM—Made from special alloy steel, accurately finished, and thrust taken by ball bearings. Provisions are made for easy accurate adjustment of worm wheel.

WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

EQUIPMENT—⅝" table slot tongues, three index plates furnished, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart furnished shows all divisions obtainable to 380.

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Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

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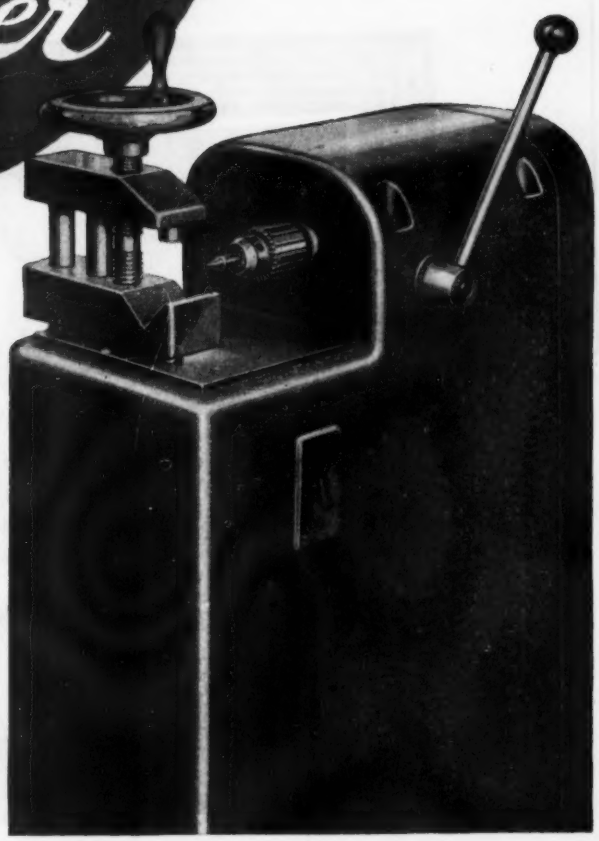
For CENTERING PARTS and SHAFTS

You Save Time and Material —and INCREASE Your Shop Output with the

MURCHEY

Quickcenter



THIS machine is a speedy, easy and accurate performer. It's so easy to use that any workman can handle it. You simply insert one end in the Vee-Block, tighten the hand wheel and advance the center drill—then reverse the bar and center the other end. The **Quickcenter** will do in less than a minute a job that may take over half an hour on a lathe — and do it far more easily and more accurately. The **Quickcenter,** small and compact, increases shop output, uses unskilled operators, saves time and material—and increases your profit.

Write **for detailed information to Dept. A**

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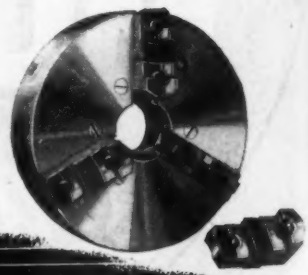
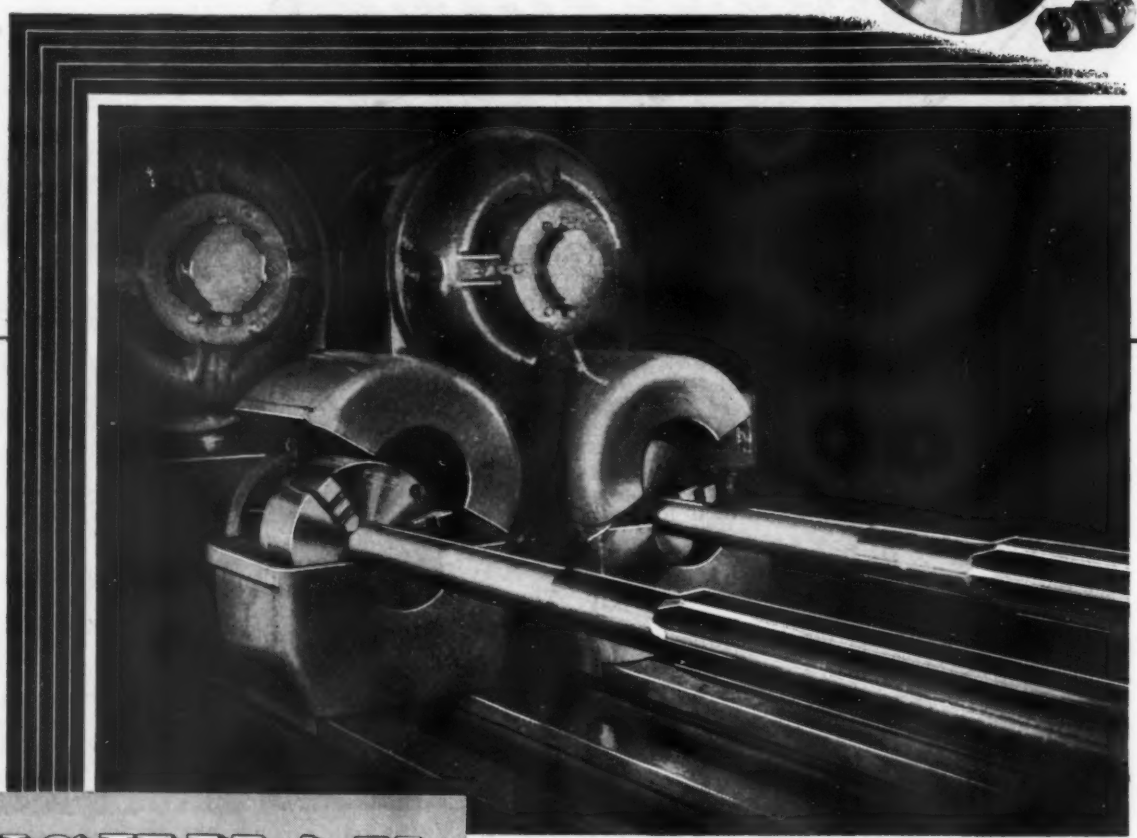
Heavy weapons . . . heavy ammunition . . . mobile units . . . these are primarily jobs for machine tools and Cushman Chucks. You are working for peak production. We stand ready to help you in every possible way. If you need chucks or parts in a hurry, call us. We may be able to break a bottleneck. If you have a special work-holding problem, call our engineering department. They usually have the right answer quickly.

Anticipate FUTURE needs NOW . . .

Without losing an hour from war production you can still take at least one constructive step toward re-conversion by talking over your future chuck replacement needs with Cushman today. Many chucks now on war production will have completed their useful life before V-day. They should be replaced. More important still, special or standard jaw equipment exactly "tailored" to your new work-holding needs will help you reduce floor-to-floor time and cut unit costs. Get in touch with Cushman NOW. The Cushman Chuck Co., Hartford 1, Conn.





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Vital to the World's Air Borne Traffic

THE Aviation Industry has achieved faster production and lower costs by rigid accuracy in shaping, drilling and reaming parts for sub assemblies.

Standard Shield Brand Drills, by the millions, have been specified and used by all aircraft makers in achieving this faster, lower cost production.

If you are searching for ways to reduce costs and increase output, we suggest that you study the performance of your perishable machine tools. Then try Shield Brand Drills, Reamers, Taps, Dies or Milling Cutters on the jobs where production should be improved. That these tools welcome tough jobs is verified by the experience of the Aviation Industry.

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AN important step to lower production costs is to set like standards for all metal cutting operations in all departments.

To efficiently maintain these standards, all classes of metal cutting tools will need to be uniform in performance.

Standard Shield Brand Drills, Reamers, Taps, Dies and Cutters are uniform in performance. They are all made in the same plant—under the same supervision, the same scientific laboratory controls, the same rigid inspection, to the highest quality standard.

Standardizing on Standard Shield Brand Tools of the classes shown will assist you to establish and maintain uniform standards of performance in all metal cutting operations—cost saving results should follow.

Leading mill supply dealers from coast to coast furnish Standard Shield Brand Drills, Reamers, Taps, Dies, Cutters and Special Tools. They will appreciate your inquiry.

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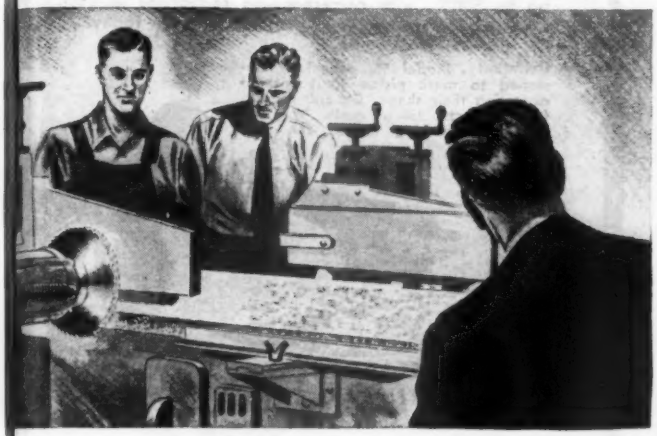
How a DISSTONEER solved a case with a set of BOROD TEETH



A well known firm makes insulating material, used on the boilers of ships for the Merchant Marine. The material is made of asbestos, magnesia and diatomaceous earth, compressed into molds and heated in ovens before going to the saws. Their saw costs were high as they had to sharpen 12 saws 4 or 6 times a day.

A Disstoneer* was called in to study this problem. He recommended certain changes in their sawing operations, plus a different type of saw with the face of the teeth tipped with Borod. At the end of nine months, these Disston Saws were still in the machine and the teeth *had never been sharpened!*

Another clear-cut case of Disston leadership!

*DISSTONEER—a man who combines the leadership and experience of Disston with sound engineering knowledge, to find the *right tool* for you—to cut metal, to cut wood and other materials—and TO CUT YOUR COST OF PRODUCTION!

A saw with teeth tipped with Borod may be of little use to you if you are a manufacturer of wood products. But you will be interested in the equally important advantages provided by—

DISSTON WOOD WORKING SAWS

There is a Disston Saw for every need. Each is a highly specialized tool, designed for a definite type of work, and made of a quality of steel best suited for the purpose. And back of every Disston Saw is more than a century of saw manufacturing experience. For faster, cleaner and more accurate work, delegate your cutting to Disston Saws. Write for full particulars.

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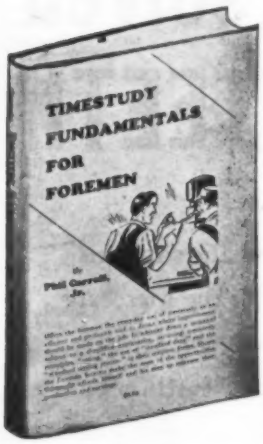
An ABC book of timestudy to help you get bigger output



Stressing exactly the problems the foreman encounters in making a timestudy and in applying new, improved standards, this straightforward manual shows just how to go about making the study, tells what to do in order to get the most out of the study, in bigger and better output and in improved working methods.

TIMESTUDY FUNDAMENTALS FOR FOREMEN

By PHIL CARROLL, JR.

Management Consultant

172 pages, 4¾ x 7⅜, $1.75

Here are the same methods used by up-and-coming modern industries—the same procedures condensed and simplified and brought by a timestudy expert to the man who wants to get more production on a down-to-earth practical scientific basis.

- The book covers the essentials with a minimum of the higher, engineering aspects.
- Wage incentive plans are covered in one chapter, to show the end result of timestudy, and these are explained in terms of fundamentals and without mathematics and system names as such.
- Much emphasis is laid on the necessity for proper "rating" of the effort made during the timestudy—rating receiving unusual attention in current meetings, committee study and periodicals.
- Considerable attention is given to taking the foreman step by step through the standard-setting process by means of standard data curves, charts, and tables, in their simplest forms.

Chapters

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2. Why Foremen Should Understand Timestudy
3. How to Begin a Timestudy
4. Looking at the Job Details
5. How Long Does It Take?
6. How Long Should It Take?
7. How to Set Consistent Element Times
8. What Job Details Repeat?
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THIS operation is typical of the way production minded executives are using Bellows Controlled Air Power units, Air Motors, Air powered vises and holding fixtures, and air operated work and tool feeds to increase production in the face of serious man-power shortages.

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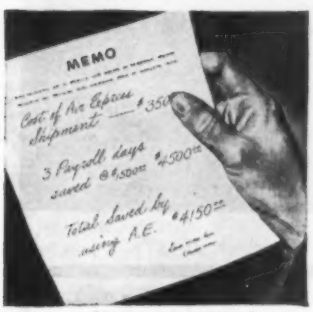

THE COST? Higher, yes. But by air; coast-to-coast delivery is made *overnight*—rather than in three or more days by other means. Air Express cost, by the way, includes special pick-up and delivery.

WOULDN'T YOU pay more to save a whole lot more? That's why thousands of manufacturers use Air Express as a matter of routine. Heavy or light, large or small, if shipment fits in a plane, it can go Air Express.

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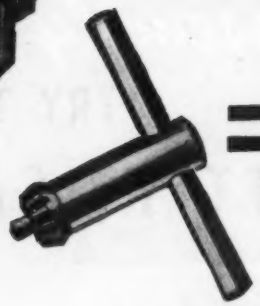
Almond Drill Chuck



The Original Manufacturers of Drill Chucks

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As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

Write for complete information.

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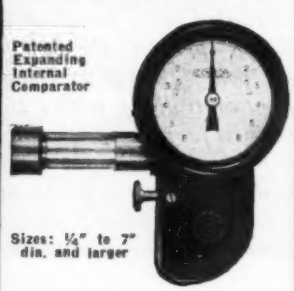
Actually ANALYZES the hole, with results to fractions of .0001"

COMTORPLUG



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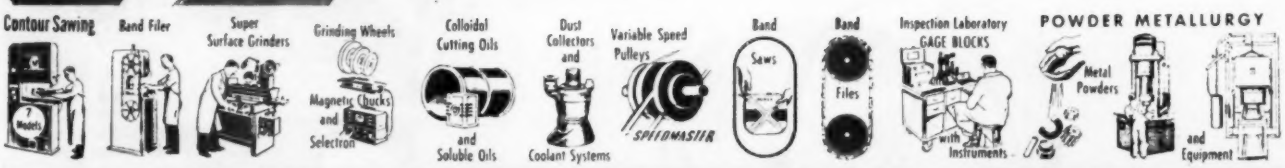
Have you a sawing problem that's hard to lick? Let our research engineers put it through our laboratory and give you a written report on the saw and speed that give best results.

Write for Circular about the sensational performance of the DoALL Buttress Saw



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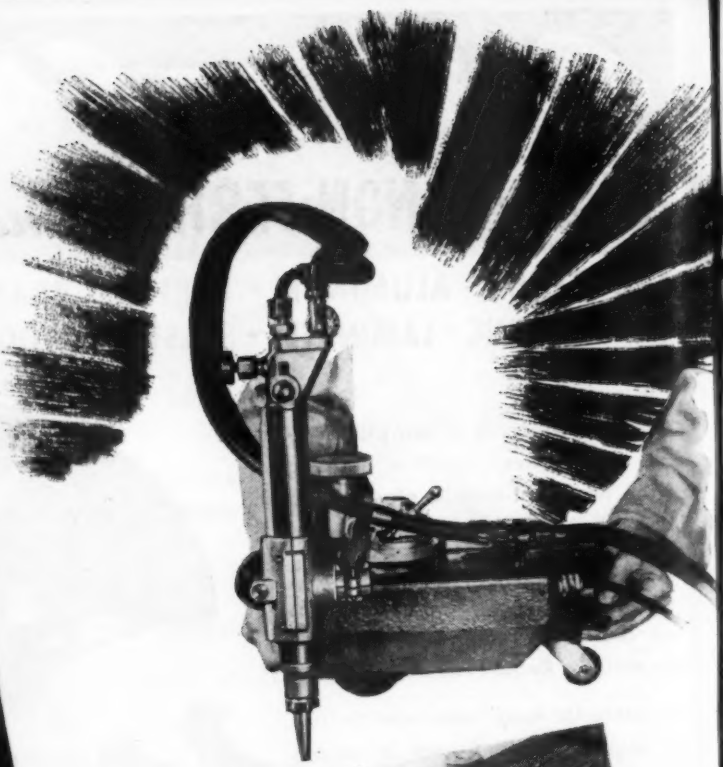
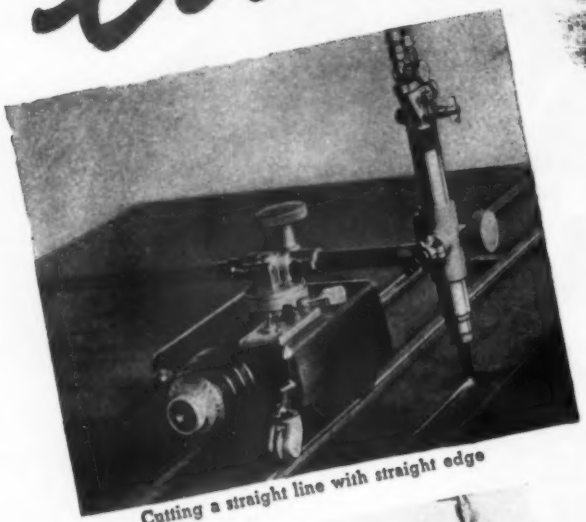
THESE *little*

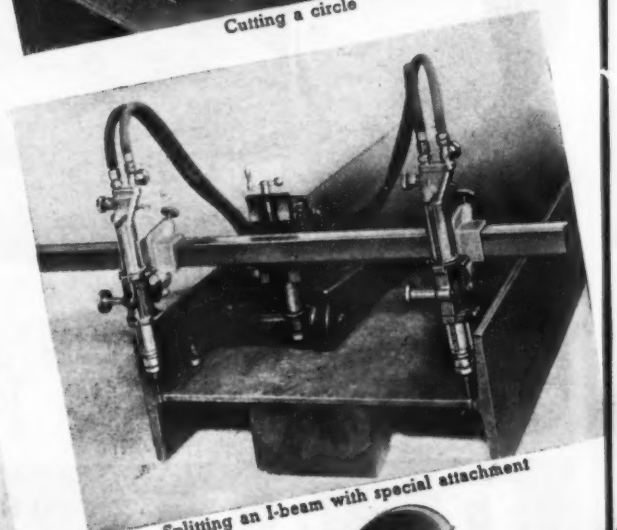




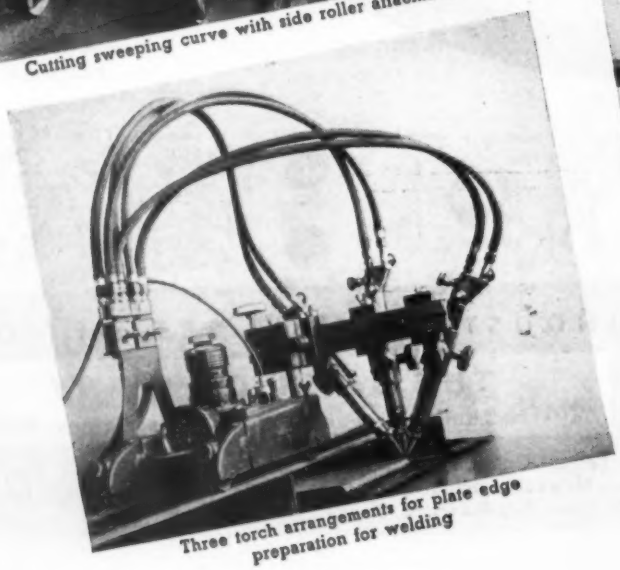
Cutting a straight line with straight edge

Cutting a circle

Cutting sweeping curve with side roller attachment



Splitting an I-beam with special attachment



Three torch arrangements for plate edge preparation for welding

Gas
FOR THE IDEA

ellows..

do many metal cutting jobs faster — more economically

Need a couple of six foot circles of 1" plate, a few three inch washers? Want to split up a big steel plate and bevel the edges for welding or cut up some structural shapes?

An Airco Radiagraph — one of Airco's small portable gas cutting machines — will do any of these jobs — and many more — and do them faster and more economically.

Operating on steel tracks furnished for five foot cuts, they will make straight cuts of unlimited length in one continuous operation when tracks are progressively positioned.

With an adjustable radius rod and center point, they will cut circles from steel plate of any thickness in a wide range of diameters.

With a side roller attachment and template shaped to guide the machine, long, sweeping curves may be cut.

The torches are adjustable to permit a perpendicular cut or one of any desired bevel. A second torch can be mounted on the machine for the cutting of two parallel straight lines with double bevel or two concentric circles simultaneously. A third torch can also be mounted on the machine for simultaneously cutting a double bevel with land to prepare plate edges for welding.

A conveniently-located indexed speed control permits the operator to increase or decrease the speed of the machine at will.

Airco Radiagraphs are made in two models, the No. 10 (weight 41 pounds with torch) and the No. 4 (weight 74 pounds with torch). Each machine is available in several speed ranges within the limitations of 2" per minute minimum and 50" maximum for the No. 10's and a minimum of 1½" per minute and a maximum of 75" per minute on the No. 4's. Both models are sturdily-built and dependable.

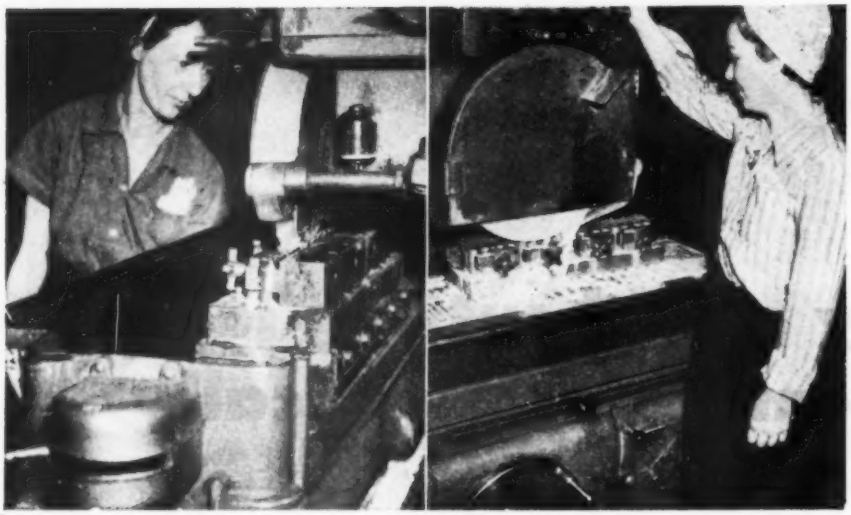
• For copies of folders containing full details on these two gas cutting machines, ask your nearest Airco office or write Dept. A.M., Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

AIR REDUCTION
OFFICES IN ALL PRINCIPAL CITIES

AIRCO

s Cutting Machines

COMBINATION OF SPEED ACCURACY FLEXIBILITY IN METAL



Courtesy N. A. Woodworth Co.

Finish grind (left) removing .003 and .005 stock, rough grind (right) removing .045 on end of knucklepins—jobs on which Economy Grinding Lubricant (water-soluble) is helping operators obtain larger stock removal.

Cooling and lubricating features as well as fast, accurate grinding with high reflective finish are made possible through the use of ECONOMY GRINDING LUBRICANT.

Manufacturers who have used Economy Grinding Lubricant for years know what can be expected of Economy products and specify them with complete confidence.

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THE WHITE & BAGLEY COMPANY
WORCESTER, MASS., Chicago, Detroit, Minneapolis

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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CINCINNATI, OHIO

Serves many machines as jig or fixture

A doubly useful tool in reconversion times, this vise, with V-jaws or special shell jaws, is ready-made for holding single or repeat-operation special shapes. Sizes from light drilling up to 124 lb. for planer, shaper.

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Desmond Hex Dresser

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Photo Courtesy General Electric X-Ray Corporation

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The flux has *got* to be right if the soldering job is to be right. Take delicate electrical connections for example. A flux that is a poor conductor must be used—a flux that is non-corrosive and that has no tendency to collect moisture, dust or other foreign matter.

Various types of seams, on the other hand, require different kinds of fluxes. Spot soldering others. Sweating operations still others.

You'll be freed of all flux doubt if you'll take this simple step: Consult Kester engineers. They'll gladly place at your command their 46 years of practical experience and laboratory research. They'll tell you just which fluxes will best protect the solder-bonds in your products. No obligation, of course.

Naturally their recommendations can best be carried out if you specify Kester fluxes, because the Kester line is *complete*—all formulas are chemically and physically right for the jobs for which they are compounded—all properly dissolve oxides on metals so that solders can alloy with the metals in a way that prevents reoxidation.

Why not check the flux formulas you are using, with Kester? A letter will bring expert Kester assistance.

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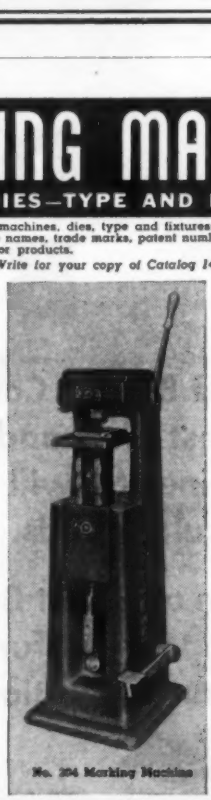
Flat Die for Marking Round Parts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Roller Die with Interchangeable Type

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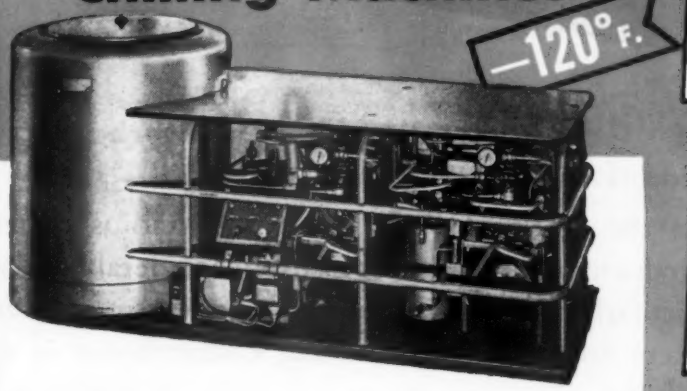
CHECK These Case Reports to Learn How Others

Increase Hardness and Toughness of Steels

. . . by Cold Treating in Deepfreeze Industrial Chilling Machines



CASE REPORT No. 1

PART—Ball Bearing Race.

MATERIAL—S.A.E. 52100 Chrome Steel.

RESULTS—After hardening and drawing, this race is Cold Treated at —120° F. Rockwell C scale hardness of 67½ to 68 results, with fine grain structure and improved lapping characteristics. Brinelling of the races is completely eliminated.

CASE REPORT No. 2

PART—Gear for Naval Component.

MATERIAL—S.A.E. 2512 Carburizing Steel.

RESULTS—Heat treating failed to bring this part to the specified hardness. After sub-zero treatment in a Deepfreeze machine, a hardness of 64 Rockwell C scale was obtained; best previous values ranged from 56 to 57.

CASE REPORT No. 3

PART—Machine Tool Overarm.

MATERIAL—S.A.E. 4615 Molybdenum Steel.

RESULTS—Heat treating produced only 57-60 Rockwell C scale hardness. Sub-zero treatment increased hardness to 60-62 Rockwell and eliminated distortion in the length of the bar.

CASE REPORT No. 4

PART—Punch Die.

MATERIAL—Atha Pneumatic Steel.

RESULTS—After heat treating and carburizing, the highest reading on this part was 58-59 Rockwell C scale. By cold treating, the hardness was uniformly increased to 61-62 Rockwell C.

These actual case reports from the field are typical of many remarkable increases in steel hardness obtained by using Deepfreeze sub-zero chilling to supplement normal heat treating procedures.

Why Cold Treating Makes Steel Harder

Metallurgists have found that steels rarely reach full hardness until a complete transformation of Austenite into Martensite is accomplished. In ordinary heat treating, this transformation is still incomplete when the steel has been cooled to room temperature.

By Cold Treating at −120° F. in a Deepfreeze machine, practically all Austenite remaining after quenching to room temperature is transformed into Martensite with a resulting increase in hardness.

Learn How Cold Treating Can Help You

To determine the exact benefits you can derive from applying Cold Treating to your hardening problem, consult the Deepfreeze Engineering Service. Their wide field experience and metallurgical facilities are at your disposal. Your inquiry entails no obligation whatever.

FREE COLD TREATING DATA BOOK For the complete and latest data on the use of Cold Treatment for metals in industry today, get the Deepfreeze Metal Chilling Data Book. In this handy working guide on the use of industry's newest production tool you can learn how to use sub-zero temperatures for the shrinking, testing, hardening and stabilization of metals in your plant. A free copy can be obtained by writing Deepfreeze, North Chicago, Ill. Write today for as many copies as you need.

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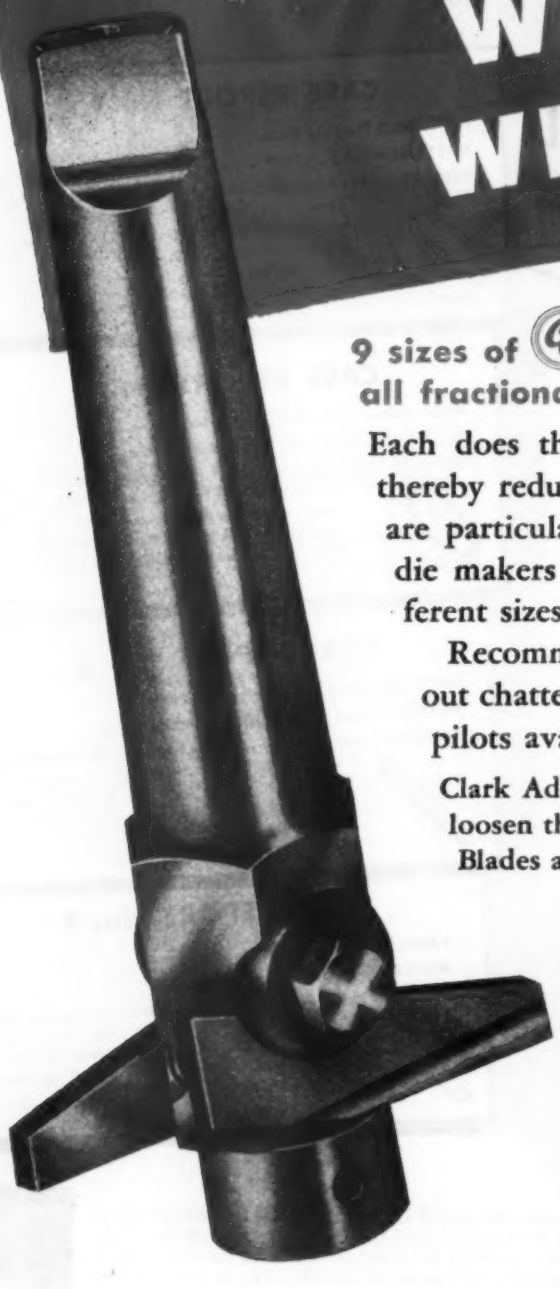
TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

DIVISION OF MOTOR PRODUCTS CORPORATION DETROIT, MICHIGAN

WHY USE 63 WHEN 9 WILL DO?



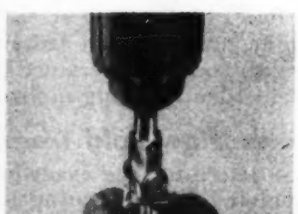
9 sizes of Clark Adjustable Counterbores cut all fractional diameters from ¼" to 5½".

Each does the work of 7 or more fixed-radius cutters, thereby reducing tool inventory costs considerably. They are particularly suitable for tool rooms, where tool and die makers are constantly needing counterbores of different sizes.

Recommended surface speeds are faster, and without chatter. Exclusive, burr-preventing interchangeable pilots available from 3/16" up, by sixteenths.

Clark Adjustable Counterbores are easily expanded. Simply loosen the locking bolts and slide cutting blades in or out. Blades are removable for sharpening.

No de-burring of pilot holes necessary with Clark Counterbores.



Clark Counterbores spot face as well as bore.

For complete information, call your Clark Cutter Jobber today, or write for catalog AM-3-CB.

Adjustable Hole Cutter

Tool Holder

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Robert H. Clark Company

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ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS

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"MOHICAN"	CANADIAN ATLAS STEELS, LTD. Welland, Ont.	"REX T-MO"	HALCOMB STEEL COMPANY Syracuse, N. Y.	"MO-TUNG"	UNIVERSAL-CYCLOPS STEEL CORPORATION Bridgeville, Pa.
"STAR MAX"	CARPENTER STEEL COMPANY Reading, Pa.	"MOGUL"	JESSOP STEEL COMPANY Washington, Pa.	"8-N-2"	VANADIUM-ALLOYS STEEL COMPANY Latrobe, Pa.
"LMW"	ALLEGHENY LUDLUM STEEL CORPORATION Pittsburgh, Pa.	"MOLITE 8"	COLUMBIA TOOL STEEL COMPANY Chicago Heights, Ill.	"TATMO"	LATROBE ELECTRIC STEEL COMPANY Latrobe, Pa.	"VUL-MO"	VULCAN CRUCIBLE STEEL COMPANY Aliquippa, Pa.
"BETHLEHEM HM"	BETHLEHEM STEEL COMPANY Bethlehem, Pa.	"REX T-MO"	CRUCIBLE STEEL CO. OF AMERICA New York, N. Y.		

New Enlarged Handbook Gives *Facts* About This Unusual High Speed Steel

● The *Fifth* Edition of the 57-page MO-MAX Handbook gives a wealth of information about high speed steels. Whether or not you are now using MO-MAX, you should send for a copy of this clear, concise booklet.

Included among its contents are details on the standard and special analyses of MO-MAX . . . brief instructions on forging, annealing, hardening, quenching, tempering . . . the new sub-zero treatments . . . tool performance . . . comparison of microstructures of MO-MAX and 18-4-1 high speed steels . . . Rockwell hardness curves and other informative charts.

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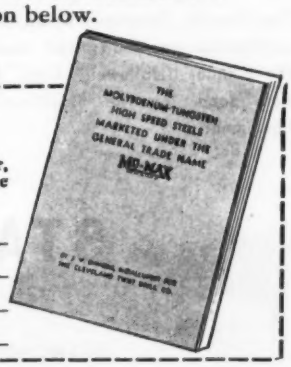

SAVE EXPENSE TROUBLE TIME

CHOOSE A

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WORK-BENCH of STEEL

Fig. 928
Pat'd &
Pats. Pend.

ready-made to suit your needs—

Fig. 1734

1367 combinations to choose from . . . interchangeable sections . . . a wide range of heights, lengths and widths . . . with so great a choice you are almost certain to find exactly the bench for your requirements. Save yourself the trouble and expense of designing and constructing your own—order a "Hallowell" Work-Bench of Steel!

Sturdily built for lifetimes of usefulness, the "Hallowell" Work-Bench stands firm and rigid without bolting to the floor, thus saving this heavy expense and permitting great flexibility in shop arrangement. Available with all metal or laminated wood tops, capable of withstanding great wear and tear.

"HALLOWELL" SHOP EQUIPMENT of STEEL

. . . includes our line of "Hallowell" DeLuxe Shop Furniture, designed in a number of arrangements to meet the specific needs of modern shops. "Hallowell" DeLuxe Work-Benches with interchangeable shelf, cabinet and drawer units are now available.

Tool Stands, Foremen's Desks, easy-rolling Trucks and work-producing Chairs and Stools are other items in the popular "Hallowell" Line. For complete information, send for the "Hallowell" Catalog of Shop Equipment.

Fig. 705

Fig. 754 Pat. Applied for

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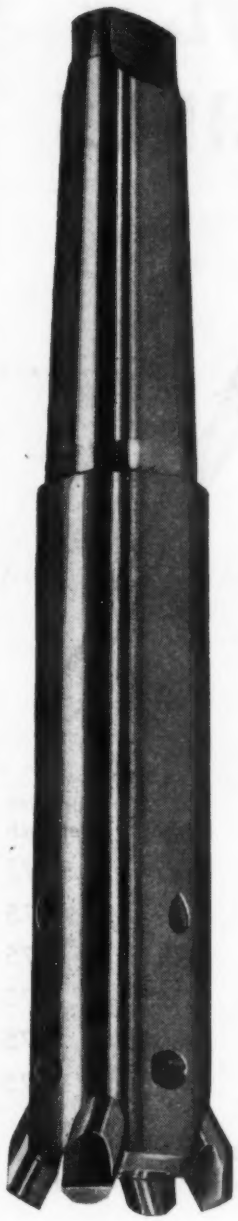
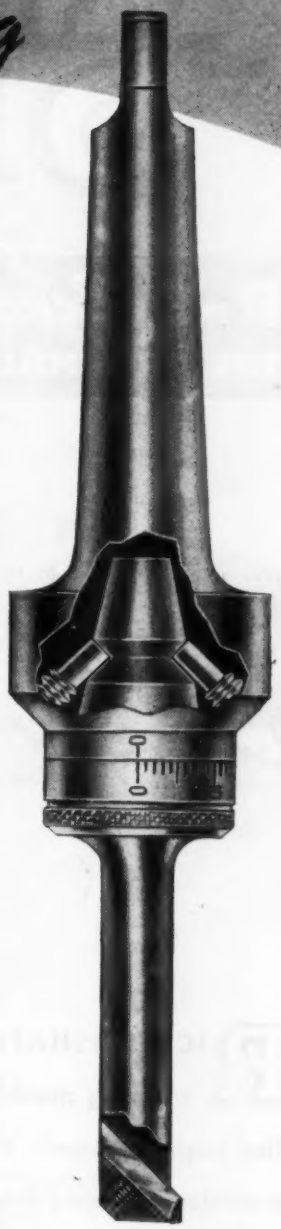
STATE TOOLS
for Speed and Economy in Precision Boring





A glance at the pictures of STATE Precision Boring Tools shows their unique features and advantages. If you haven't seen the actual tools, you'll want to get them to examine and use. They will more than meet your expectations in design, and their superior workmanship will delight you.

STATE Four-Cutter Drilling, Boring, Reaming Tools

Illustrated at left. Bits can be individually protruded for sharpening or for boring holes of larger diameter. Adjustments vary from 1/8" to 1 1/4" in the twenty standard sizes. Thus the 3/4" Four Cutter can be increased to 7/8" dia.; the 4 3/4" Four-Cutter to 6".

Special models are built in large variety to meet requirements—with duplex heads for boring two or more diameters; with wear strips, pilots, collars, facing bits, center oil holes, etc.

STATE Four-Cutter Tools have the versatility and stamina for production hole-machining from hogging to fine finishing.

STATE Dial-Set Boring Tools

See sectional view at right. Cone on insert fits socket in holder. Both are eccentric. Micrometer adjustment increases boring diameter from .000" to .050" in graduations of .001". Extension of bits gives additional increases. Total range with four inserts in "A" kit is from 3/8" to 2" dia. Inserts are interchangeable in one holder.

Original bits furnished. Standard replacement bits obtainable out of our stock or from any tool supply house. Special bits, such as carbide-tipped and diamond, on special order.

STATE Dial-Set Tools are rigid, free from chatter, low in cost. They will bottom hole bore to square shoulder, accurately bore intermittent cuts.

Both Form-Cutter and Dial-Set tools are regularly supplied with a variety of shanks. Bodies are alloy steel heat-treated for toughness. Full information will be gladly sent upon request. Write, wire, or phone.

STATE MANUFACTURING & CONSTRUCTION CO.
1940 N. DIXIE HIGHWAY **FRANKLIN, OHIO**

Each bit can be protruded separately by means of a follow screw. Bit held firmly by a setscrew. Rugged construction for heavy production work.

Dial-set kit contains holder and four interchangeable inserts in neat case. Model "A" inserts have minimum boring diameters of 3/8", 9/16", 13/16", and 1 1/16". Ask about other kits.

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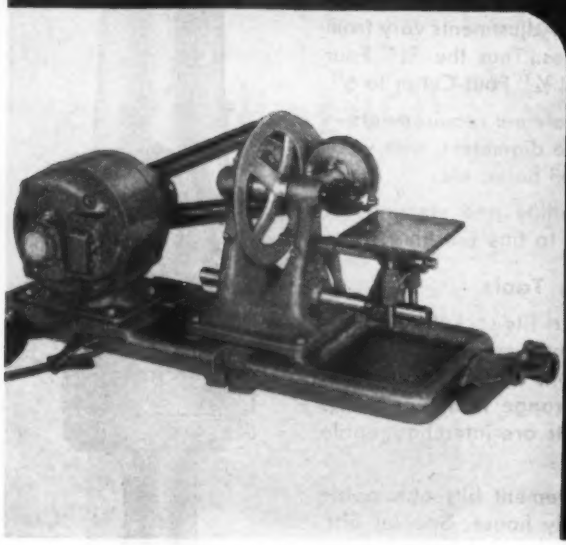
FOR 35 YEARS

R-S *Bench Style* TAPPER

THE ORIGINAL FRICTION DRIVE TAPPER



for

TAPPING
GAUGING
REAMING
BUFFING
etc.

• Built in 3/16" and 5/16" sizes complete with motor, integral toggle switch and cord. Other models for belt drive in bench and pedestal mountings.

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Long Length

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If you buy 60 drills or more — 20% discount

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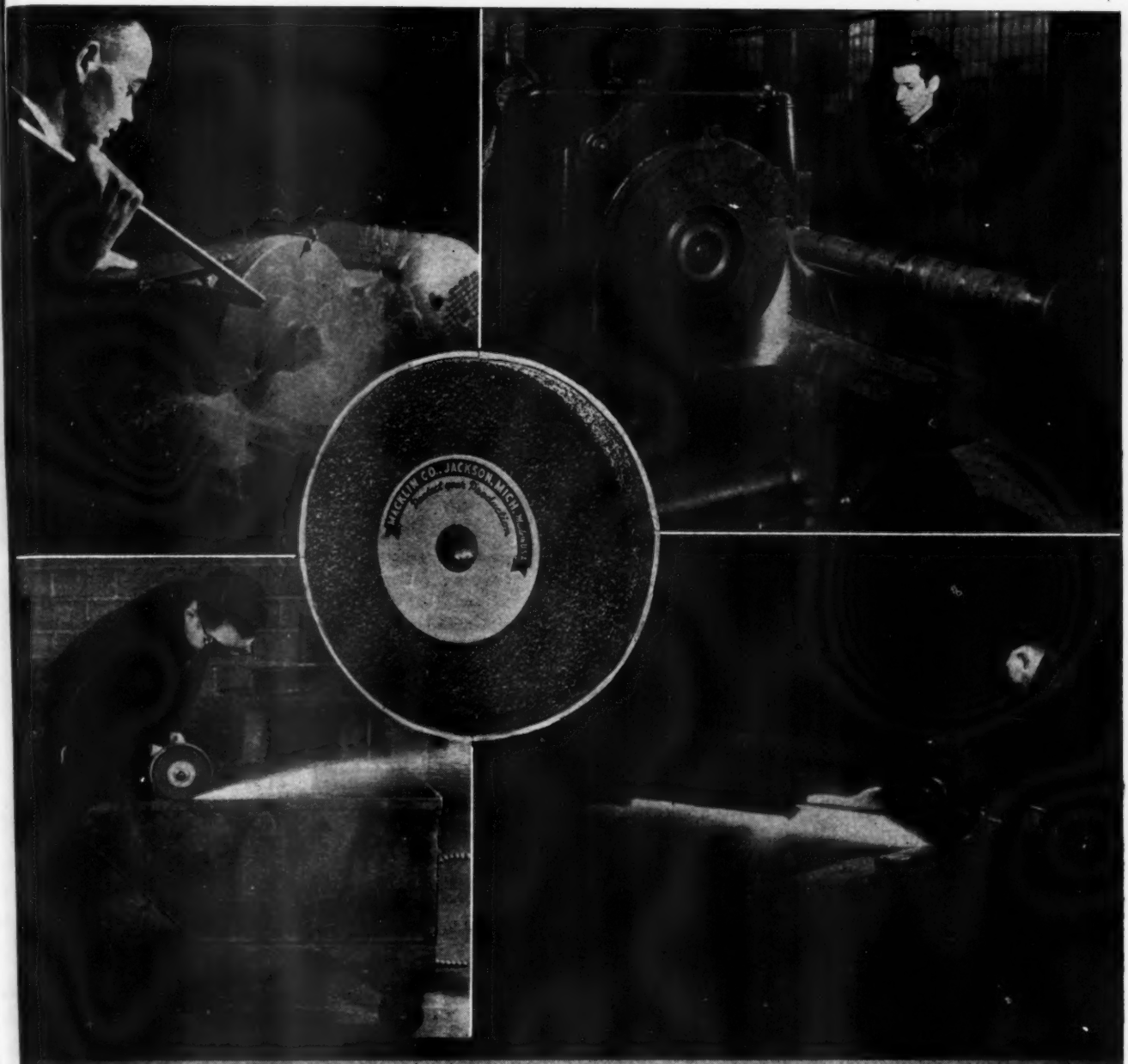

MACKLIN GRINDING WHEELS are used in all industries. Regardless of whether your grinding operation calls for the tiniest internal wheel or any size up to a 42 inch diameter, **MACKLIN** can fill your requirements. Get **MACKLIN** uniformity and *"Protect Your Production."*

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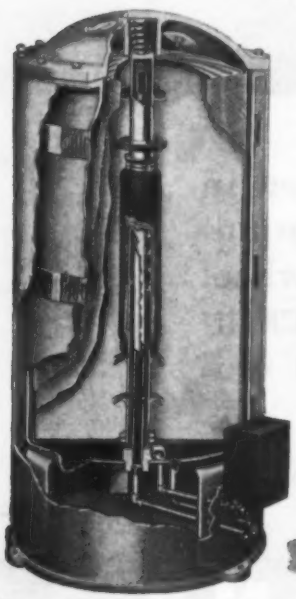
- Dirty or contaminated lubricating oils will cause excessive wear on moving parts.
- The proper purification of lubricating or industrial oils will remove this damaging dirt or contamination and will save you thousands of dollars in repairs and maintenance work. It will also increase your production and reduce machine down time.



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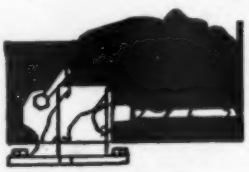
MEAD *Presents* the AIR PRESS

These new Mead Air Presses deliver 400 and 1200 lbs. pressure respectively on 100 PSI. Handle many staking, crimping assembly and similar operations. CLEARANCE 4" and 7½" respectively. With foot control these presses will speed up countless bench jobs, save muscular effort. Write for new Air Power Catalog—just off the press.

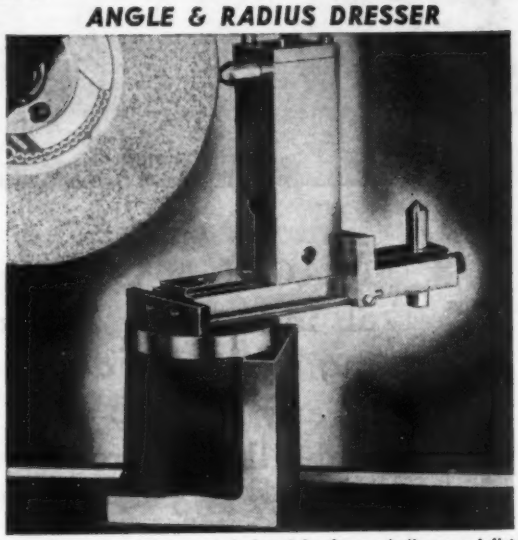


MEAD SPECIALTIES COMPANY

4114 N. KNOX AVENUE
Dept. MA-345 • CHICAGO 41, ILL.

The "FORM MASTER"

ANGLE & RADIUS DRESSER



A sturdy, quality instrument designed by form-grinding specialists to dress BOTH angles and radius at low cost. Two 1/3 ct. diamonds and case included—$150.00 complete.

Features

Large range	.0001" accuracy obtainable
Chatterless	Simple to operate
Dustproof	Reasonably priced

Call your supplier or write

J. & S. TOOL CO. 477 Main Street E. ORANGE 1, N. J.

MEASURE *Carbide Value* BY THE YARDSTICK OF PRODUCTION

MORE PIECES BETWEEN GRINDS

MORE GRINDS PER TOOL

LESS DOWN TIME

LOWER TOOL COST

The only sound basis to measure the value of any carbide tool is . . . "How much does it produce?" TECO Cemented Carbide is ready to answer that question by showing increased production on your own machines, under your own conditions.

MAKE THIS CHANGE! Tool up a machine or two with TECO Cemented Carbide, in place of present carbide tools. Run exactly as before—then see for yourself that TECO stays on the job longer, produces more pieces.

Send details of your set-up—or discuss your needs with one of our tool engineers. Send for catalog and price list.

IMMEDIATE DELIVERY FROM STOCK can be made on most standard **TECO Cemented Carbide Tools and Blanks.**

TUNGSTEN ELECTRIC CORPORATION **568 39th Street, Union City, N. J.**

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Representatives: Indianapolis, Ind. Chicago, Ill. Detroit, Mich.

TECO

Pioneers in Tungsten Carbides for over a Quarter Century

CEMENTED CARBIDE

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

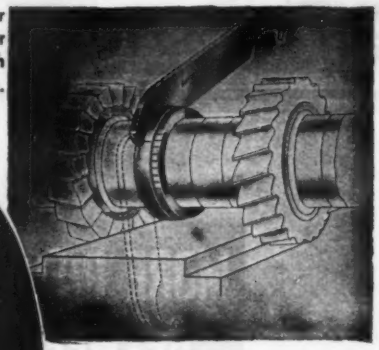
CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling setups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

Write for illustrated bulletin ± 120-1

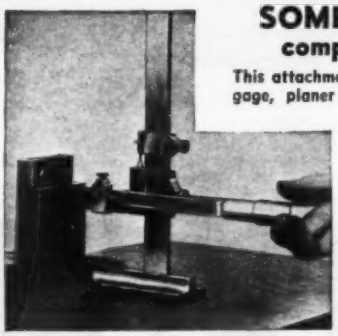
DAYTON ROGERS MFG. CO.
2835 12th Ave. S. Minneapolis, Minn.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

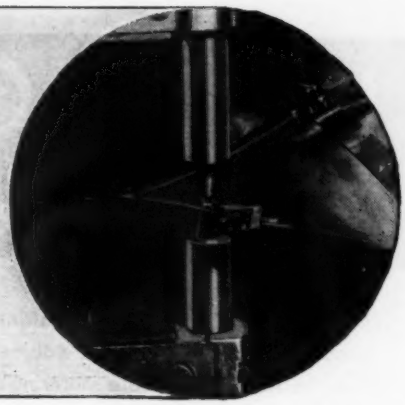


SOMERSET LAYOUT
complete set $16.00

This attachment quickly converts your height gage, planer gage or gage blocks into a tool that can be compared to a jig borer. With it you can layout work easily and accurately. Designed to mark off vertical distance from a plane surface and by the use of the inserted center punch holder, the locating of holes for jigs, fixtures and dies can be accurately obtained. Write for complete details.

SOMERSET TOOL COMPANY
232 Virginia Street — Hillside, New Jersey

DO'S *and* DON'TS
for
Resistance Welding Electrodes and Holders



Do's

1. Use the proper electrode material for the job you are doing.
2. Use standard electrodes wherever possible.
3. Use the most suitable tip diameter for the thickness of stock being welded.
4. Use open sight drains to observe more readily the water flow through holders.
5. Connect the water inlet hose to the proper holder inlet so that water flows through the center cooling tube first.
6. Internally cool spot welding tips with cool water flowing at a rate of at least 1½ gals. per minute through each tip.
7. Be sure that the internal water cooling tube of the holder projects into the tip water hole to within ½" of the tip hole bottom.
8. Adjust the internal water cooling tube of the holder to the proper height when changing to a different length tip.
9. Be sure top of adjustable water cooling tube in holder is cut at an angle to avoid jamming tip down and shutting water off.
10. Place a thin film of cup grease on the tip taper prior to inserting it in the holder, to make it easier to remove.
11. Use ejector type holders for easy removal of tips and to avoid damage to tip walls.
12. Keep the tip taper and holder taper clean, smooth and free from foreign deposits.
13. Dress spot welding electrodes often enough to maintain the quality of welds.
14. Dress electrodes in a lathe to their original contour whenever possible.
15. Use a rawhide or rubber mallet for striking holder or tips in aligning operations.
16. Provide flood cooling on both sides of the seam welding wheel.
17. Use properly designed knurling wheels to maintain proper seam welding wheel shape.

Don'ts

1. Never use unidentified electrodes or electrode materials.
2. Avoid special, offset or irregular tips when the job can be done with a standard straight tip.
3. Don't use small tips on heavy gauge welding jobs, or large tips on small work.
4. Don't forget to turn on the cooling water full force before starting to weld.
5. Never use water hose that will not fit the holder water connection nipples snugly.
6. Do not allow water connections to become leaky, clogged or broken.
7. Avoid using holders with leaking or deformed tapers.
8. Never use electrode holders that do not have an adjustable internal water cooling tube.
9. Do not permit adjustable water tube to be "frozen" by accumulation of deposits. A few drops of oil periodically will keep the tube free.
10. Do not allow electrodes to remain idle in tapered holder seats for extended periods.
11. Don't use pipe wrenches or similar tools in removing electrodes.
12. Avoid using white lead or similar compounds to seal a leaking taper.
13. Never permit a spot welding tip to mushroom enough to make dressing difficult.
14. Never dress electrodes with a coarse file.
15. Don't pound on holder or tip with a steel hammer in aligning the welder arms.
16. Avoid the use of seam welder wheels too thin to stand the heat or pressure of your job.
17. Do not permit seam welding wheel to run off the corners of the work being welded.

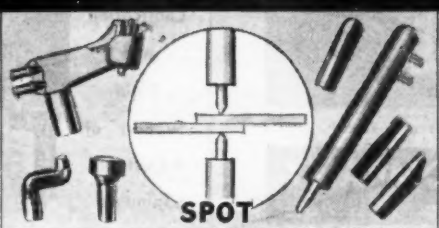
DO obtain higher output by using Mallory Standard Resistance Welding Electrodes—Spot Welding Tips and Holders. Consult us for seam welding wheels and flash, butt and projection welding dies for your particular application. Write on your company letterhead for your copy of the electrode catalog and the Mallory Resistance Welding Data Book.

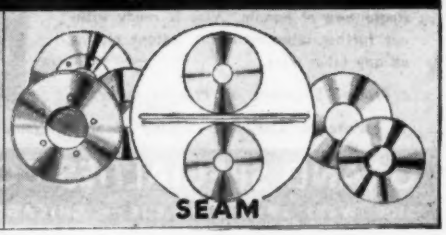
One of a series—the entire series mailed at your request.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

P. R. MALLORY & CO. Inc

MALLORY *Standard Resistance Welding Electrodes*





HOLE ✓ CHECKER

AN AIR GAGE for CHECKING HOLE SIZES with GREATER ACCURACY

The HOLE ✓ CHECKER is substantially built, light, easily set-up. The durable wrinkle-finish metal cabinet, 13" high by 9" wide and 4½" deep, houses the accurate metering mechanism, pressure regulating valve and front dial indicator.

The HOLE ✓ CHECKER may be used on bench for bench inspection or equipped with a flexible hose adaptor connecting special sizing plug with the unit. Thus the gaging may be done without removing work from machines. It always tells the operator just "how the job is running".

The sizing plugs are specially designed for your production and are made of hardened steel to very close tolerances. The 3½" dial is as easily read as a time clock and can be quickly calibrated to register .0001" or less.

Send your blueprints or sketches for quotations.
For complete details, send for Bulletin 43-MT.

Unit with hose adaptor and sizing plug for gaging piston bearing.

OTHER AMERICAN PRECISION PRODUCTS

Amplifying Gages
Thread Checkers
Bench Centers
Radius Dressers
Lapping Plates

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO

NEW! Takes but a second to close or open!

GRAND Speed QUIKCET VISE

CHECK THESE FEATURES

- Instant Ratchet Screw Closing. Opens instantly with Trigger Release. No wasted time running screw in or out.
- Balanced Precision Grip at all points. Hardened Serrated jaws *integral with body*. No jaw plates to come loose. Heavy guide rods.
- Multiple Strength — Alloy-Steel extra thick wall body construction.
- Anvil top. Bottom screw clamp for quick shifting of vise.

This QUIKCET VISE can be set and closed, or opened in a jiffy. Simply push on body of free jaw which slides swiftly in on ratchet screw and precision guide rods—tighten with a turn of handle. Balanced precision grip holds firmly at all points. QUIKCET VISE opens instantly to full 3 inches by pressure of thumb or finger on Trigger Release after tension is eased by single turn of handle. Vise is ready without further adjustment for instant closing on any other work.

Prompt Shipment on Priority Orders.

Write for Complete Catalog of Speed Clamps and Vises.

GRAND SPECIALTIES COMPANY
3100 WEST GRAND AVENUE • CHICAGO 22, ILLINOIS

ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

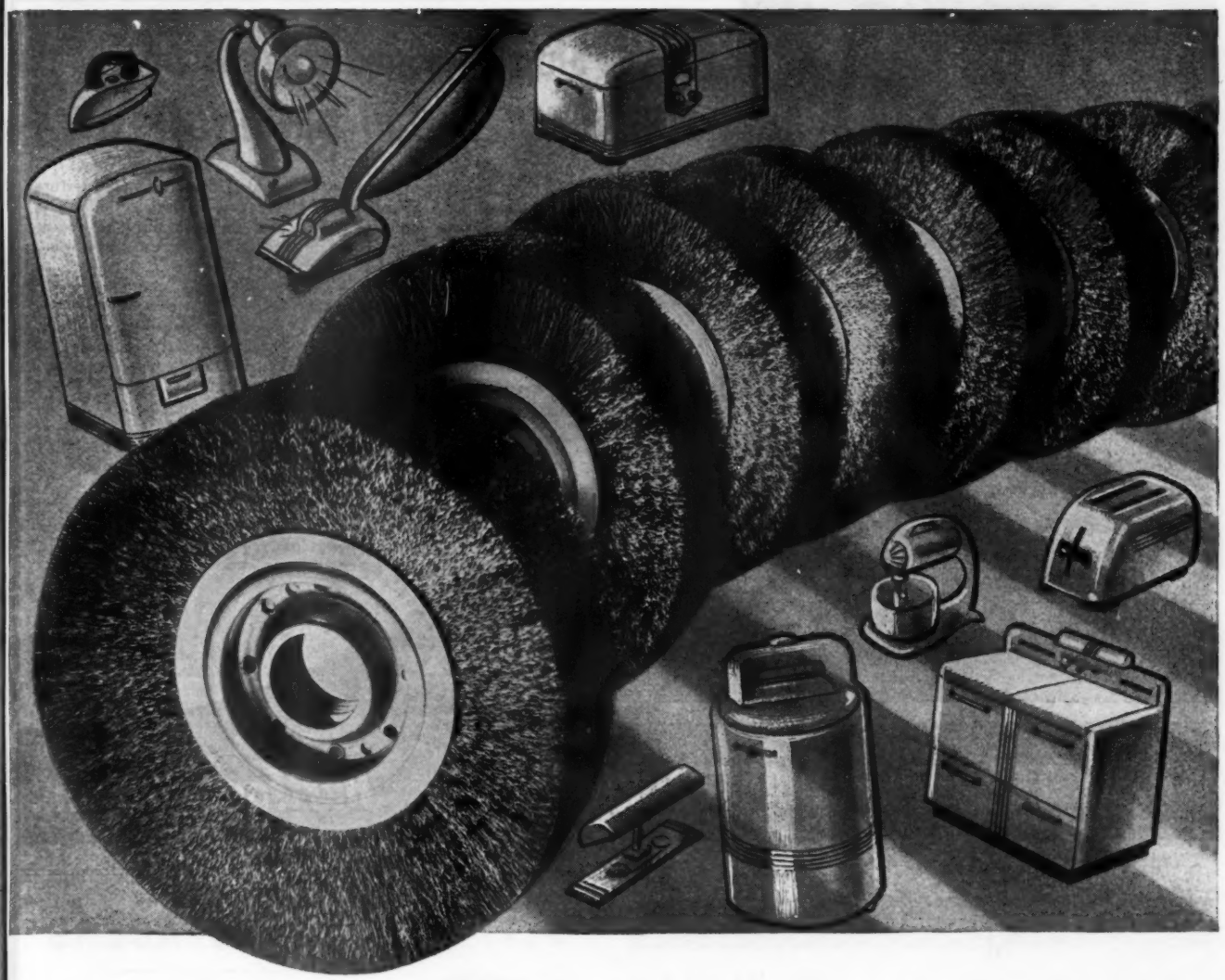
MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD



Shape of *Better* things to come

YOUR NEW PRODUCTS are probably already on the drawing board—or else they've passed beyond that stage. And they'll have to be *better* products to stand up against vastly increased postwar competition.

Now is the time to discover how power brushing can help you make them better.

Better looking . . . better performing . . . and better selling!

New power brushing techniques as developed by Osborn, 50-year pioneer and leader in the field, can help you cut costs, by cutting operating time on all finishing operations.

In war-vital industries today we've helped reduce time on many jobs from hours to minutes, and at the same time improved the product.

These new techniques can be applied to almost any product and material—metal, plastic or fabric.

It will pay you to investigate now. Write, wire or phone Osborn and an expert field engineer will be detailed to make a thorough study of your obligation or plans. He will then submit to you specific recommendations. No obligation, of course.

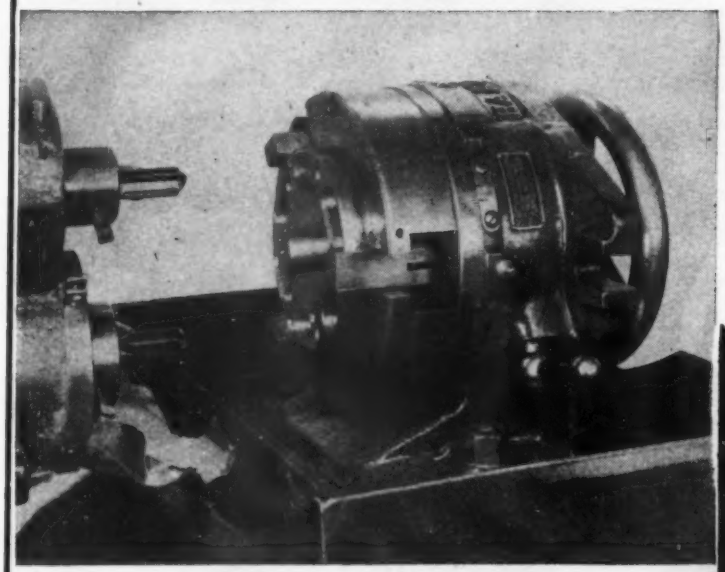
THE OSBORN MANUFACTURING COMPANY *5401 Hamilton Avenue, Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

The HARTFORD SUPER-SPACER

Simplifies and Speeds up FINISH MILLING of DRIVING PLATES



By mounting a hand-wheel-operated quick clamping fixture on a Super-Spacer base, this set-up for finish milling is simply accomplished. The part . . . an airplane engine part . . . is securely held and accurately indexed during finishing operations.

The Hartford Super-Spacer lends itself to an almost unlimited variety of indexing operations in milling, drilling, slotting, planing and jig boring. Assured accuracy is maintained under heavy cuts and all chance of error eliminated by fool-proof mask plates.

This modern holding device is profitable to use on single pieces or in mass production. Attachments are available for plain and radial drilling which greatly increase its versatility.

Get full details today. Take advantage of the time savings assured by the Super-Spacer to speed up your work.

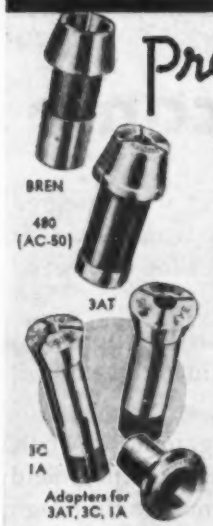
THE HARTFORD SPECIAL MACHINERY CO. *Hartford 5, Conn.*

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

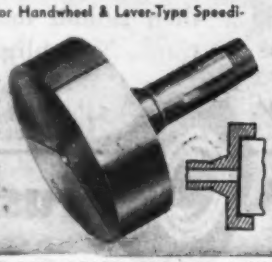
IMMEDIATE DELIVERY FROM STOCK



The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

- MODEL 3AT. For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



- 5C KLUTCH-KOLLET NOW READY. List unbored $10.80.
- PRECISION Collets also available in Hex. and Square.

GENERAL DIE-STAMPING-TOOL COMPANY • 362 Mott St., New York 12, N. Y.

ARTUS PLASTIC

SLITTING SAW SPACERS

Artus U.S.Pat.

Identify Thickness by Color UP TO 12" OUTSIDE DIAMETER

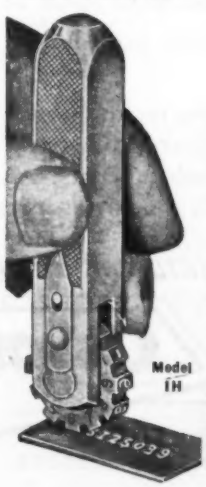
Long life of steel spacers at only a small fraction of the cost

Illustrated Folder Free

Immediate shipment on all types of plastic spacers, gaskets, shims

INDUSTRIAL PRODUCTS SUPPLIERS

Dept. AM, 106 Water Street *New York 4, N. Y.*



NUMBERALL ROTARY STAMP

A single wheel Stamp for stamping figures and letters on brass, aluminum or soft steel; plastic, wood, with a single hammer blow. All figures on 1 wheel; entire alphabet on 2. One stamp replaces 12 individual, hand stamps. Characters furnished any size from 1/16" to 3/8". Also supplied with shank for press. Write for Bulletin AM-1H.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

KEEP YOUR MACHINES *Running*

DON'T STOP SPINDLES TO CHANGE TOOLS

MODERN-MAGIC CHUCK
AND COLLET EQUIPMENT

Increase your production through elimination of spindle stoppage for tool change. With Modern-Magic Chuck and Collet equipment, tools are quickly and easily changed as the spindle revolves at operating speed. Simple, advanced design makes Modern-Magic Chucks and Collets practically trouble-free. Sturdy, fool-proof construction insures longer accurate service. Your copy of Bulletin M-101 giving full information will be sent upon request. Today?

PROMPT SHIPMENT.....USUALLY MADE FROM STOCK

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

STAR
HIGH SPEED
MOLY
I say look at those sharp teeth hardened to cut deep and wear longer.
Large easy-to-read markings make it a simple job to choose the correct Clemson blade for every job.
It's the finest grade of high-speed steel scientifically heat treated to give Clemson blades longer wearing and cutting qualities.
Just like I said, the accurate set provides ample clearance and accuracy of material being cut.

A BLADE PLUS!

It's a Cinch to Buy Blades This Way

You don't buy a "pig in a poke" when you select a blade from this open-face STAR display. Blade withdrawal is "finger-tip" operation. Just slip a blade out through the top of the open box, and satisfy yourself that STAR blades are the blades you want for the type of work you are doing. The STAR Unbreakable Special Flexible Blade is also an all-around blade for the expert mechanic.

KNOW-HOW BOOKLET

Use the coupon to send for copy of "Metal Cutting"—a miniature textbook on selection, care and use of hack saw blades and frames.

7391

CURTIS
AIR CYLINDERS
Engineered to Your Problem
Save Time — Save Labor

The unique car-dumping mechanism illustrated above is operated by a Curtis Air Cylinder which raises and lowers the car body. It saves time in dumping, is easily operated by one man, and speeds up material handling for Universal-Atlas Cement Company, Hudson, N. Y.

Engineered to the individual problem in a variety of applications, whether a handling, lifting, pushing, or pulling operation, Curtis Air Cylinders are stepping up production and cutting costs in hundreds of industries today.

Installation cost is low and power consumption small, using regular shop or plant air lines. Under continuous service and heavy-duty conditions, Curtis Air Cylinders are giving unfailing service —the result of rugged construction and simplicity of design—only one moving part.

Exceptional accuracy of control—no risk of injury due to overloading or bad atmospheric conditions. Because of their efficiency, low maintenance costs, and long, trouble-free life, important savings in costs and in man-hours are almost inevitable wherever Curtis Air Cylinders or Air Hoists can be used.

It will pay you to write for full details and for free booklet, "How Air Is Being Used in Your Industry." Write today.

CURTIS

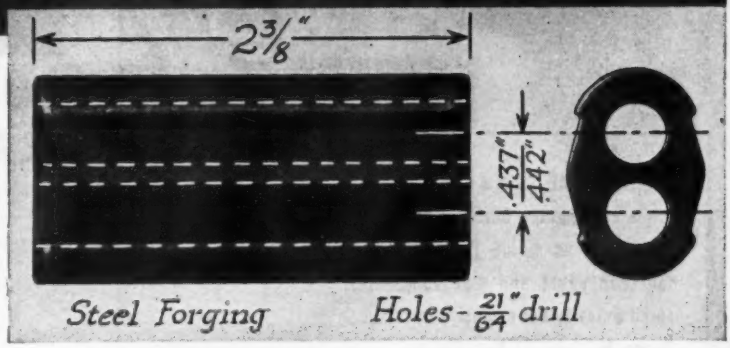
ST. LOUIS • NEW YORK • CHICAGO • SAN FRANCISCO • PORTLAND

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue, St. Louis 20, Missouri

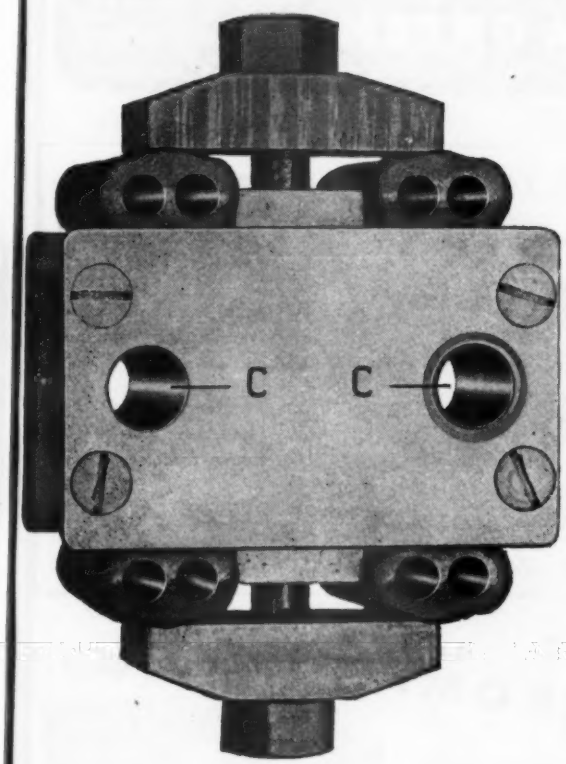
Please send me booklet, "How Air Is Being Used in Your Industry."

Name .....
Firm .....
Street .....
City ..... Zone ..... State .....

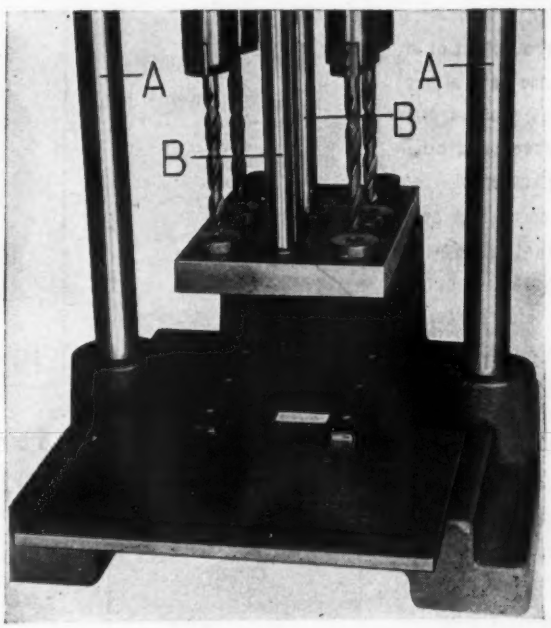
500% JUMP IN PRODUCTION
on this drilling job—made by an Ettco-Emrick MULTIPLE DRILLING HEAD with MAGAZINE FIXTURE



THE JOB—Drilling the two holes in this forging with a single spindle jig was too slow and costly. Also, the holes, drilled half way through from each end, did not always meet because of torsional run-out. The job was put up to Ettco-Emrick—results 500% jump in production with costs lowered in proportion, and holes accurately drilled. The job was a "natural" for Ettco-Emrick's *Magazine Fixture method*—one of the many adaptations of the Ettco-Emrick System of Multiple Heads for drill press use. Here's how it works.



(1) Magazine shown at lower left holding four parts is placed under the bushing plate on cradle shown below. (2) Four holes are drilled simultaneously, half way through. (3) Magazine is turned 180° and the other four holes are drilled. (4) Magazine is turned upside-down and operations (2) and (3) are repeated. (5) Magazine is removed and replaced by another which was loaded while the first one was on the press. Using 2 magazines in this way, accurately drilled parts come off the press in a steady stream.



This cradle with bushing plate is tied to the drill head above it by the two guide posts A, A, like a punch and die. Head and cradle are simply mounted on drill press as a unit.

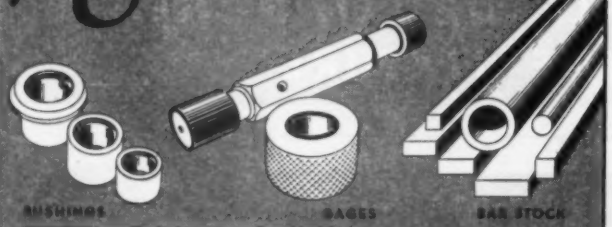
Note the locator rods, B, B. They are part of the drill head and come down with it to engage bushed holes C, C, in the magazine, assuring accurate alignment and rigidity.

BEFORE you go ahead with any small parts drilling or tapping job and spend a lot of time and money making up jigs and other devices, send a drawing or sample part with essential data to Ettco-Emrick for recommendations—as many manufacturers are doing regularly. You will find, as they have, that it saves a lot of time and trouble and assures top production at bottom costs. Try it on one job.

ETTCO TOOL CO.
590 Johnson Ave., Brooklyn 6, N. Y.

Over 25 years specialization in solving industry's drilling and tapping problems

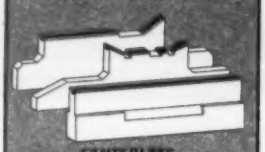
TALIDE-TIPPED for *Extra* Production!

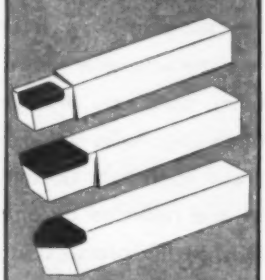


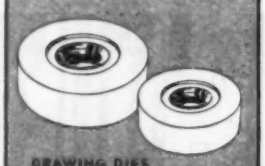
TALIDE METAL . . . is a superior grade of Tungsten Carbide—developed by us during the past fourteen years and manufactured today by our exclusive Hot Press Method. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Our special process makes it possible to produce Talide Metal wear strips in any length, die nibs and bushings with hole sizes up to 24", and tool tips with extra hardness and toughness.

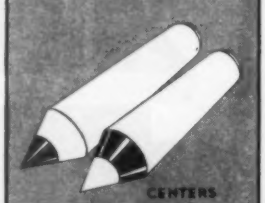
War plants all over the country are using super-hard Talide Metal to increase the output of all types of ordnance material processed on lathes, grinders, draw benches, presses and other metal-working equipment.

When peace comes, the extra advantages that Talide Metal offers of LONGER LIFE, BETTER FINISH, CLOSER TOLERANCE and MORE CONTINUOUS MACHINE OPERATION will make it possible to produce greater quantities of lower cost peace-time goods. Our experienced organization will gladly recommend where Talide Metal can profitably increase your production. Your inquiry will receive our prompt attention.


CENTERLESS BLADES


CUTTING TOOLS


DRAWING DIES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TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

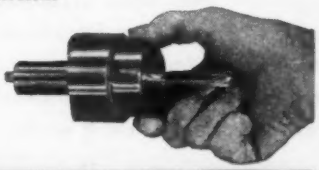
GREEN

FULL FLOATING REAMER HOLDERS

Distinctively simple, giving a free floating action that will not cramp or cause bell-mouthed holes. The float principle is based on two synthetic rubber rings, and uses no balls, rollers, springs, friction devices or similar moving parts. Now made in 3 sizes for No. 00, 0, and 2 Brown & Sharpe Automatic Screw Machines. *Write for Descriptive Bulletin.*

ADJUSTABLE FLOAT

The float tension on GREEN Reamer Holders is easily adjusted in working position as shown. This automatically centers the reamer and eliminates hang.



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MAKE YOUR LATHES MORE PRODUCTIVE WITH H & H 6 TOOL TURRETS

Adaptable to any engine or speed lathe. Speed production-cut costs.

Sizes: (over all dia.) 3", 3½" and 5¼". *Write for Descriptive Circular.*

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D&T MICROMETERS AND SNAP GAGES

Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . . *Write for Bulletin 200* or outline your gaging problems.

• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

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"Char-Mo" ..choice of the Specialist

ANOTHER large, modern, commercial heat treating plant, specializing in the hardening of high speed tool steels, after thorough investigation has selected Surface Combustion Char-Mo Furnaces.

HUNDREDS of other plants doing similar heat treating have also accepted Char-Mo Furnaces as the standard for the prevention of scaling and decarburization.

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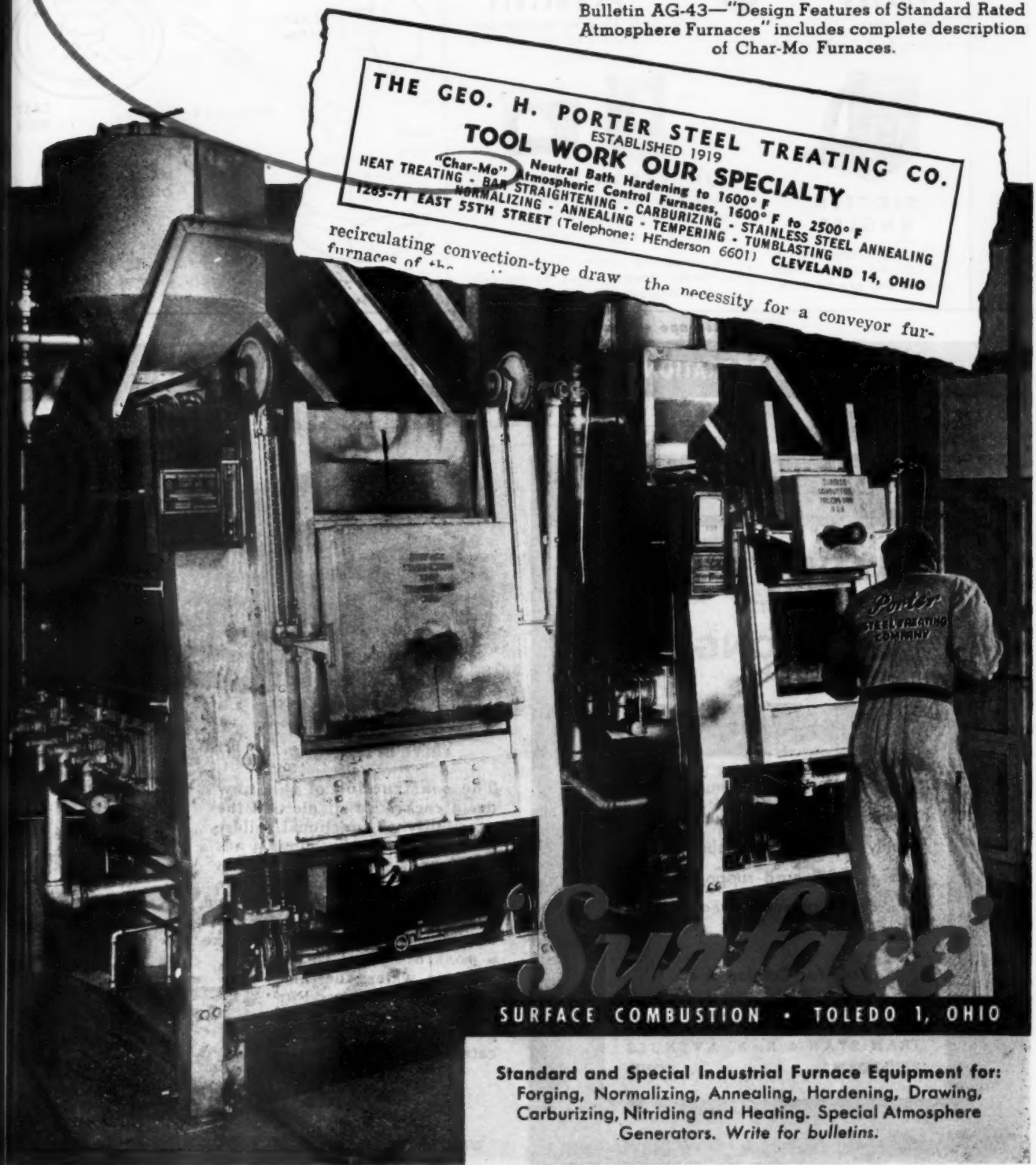
THE GEO. H. PORTER STEEL TREATING CO.
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TOOL WORK OUR SPECIALTY
"Char-Mo" Neutral Bath Hardening to 1600° F
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Standard and Special Industrial Furnace Equipment for: Forging, Normalizing, Annealing, Hardening, Drawing, Carburizing, Nitriding and Heating. Special Atmosphere Generators. *Write for bulletins.*

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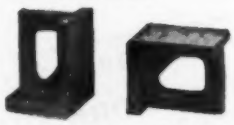
Showing RELIABLE MEASURING AND CHECKING EQUIPMENT

SURFACE PLATES
Over 50 sizes, ranging from 7 x 7½ to 96 x 192.

BOX PARALLELS
In 15 sizes, ranging from 3 x 4 x 12 and up — in ground finish.

SLOTTED ANGLES
In 19 sizes, ranging from 4 x 9 x 5 and up—in both scraped and ground finish.



UNIVERSAL ANGLES
In 10 sizes, ranging from 4 x 3¾ x 5 and up—in ground finish.
Special sizes made to order.

Also, measuring angles, angle plates, vee blocks, straight edges, boring mill parallels, steel parallels, cylinder squares.

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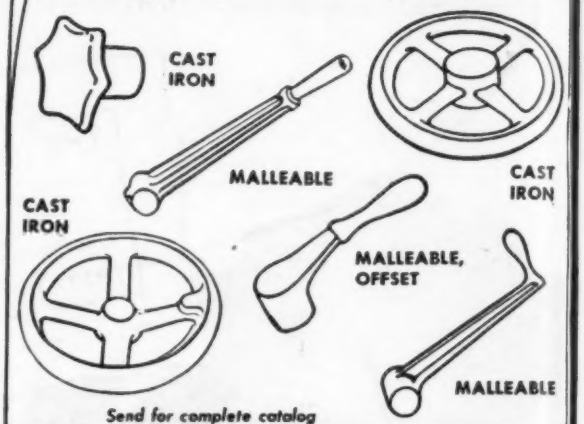
Ready for immediate shipment



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We rescrape surface plates and repair angles, cubes, etc.

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LATHE TOOLS *that* LAST LONGER

because holders are made of a chrome nickel drop forging, practically unbreakable in shop practice. A file hard support under the cutter *prevents breaking of tool bits.*

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The READY TOOL CO.
IRANISTAN & R. R. AVENUES
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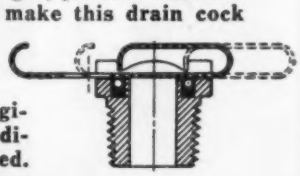
PUSH TO CLOSE
Can you use a new drain cock that— will operate under pressures up to 200 lbs. per sq. inch? can be used with all types of liquids?
VALVE OPEN
TO OPEN
VALVE CLOSED

The construction of this new drain cock is so simple that the possibility of functional failure is reduced to a minimum. It has but four working parts and is sealed with a standard "O" type ring that can be easily replaced. Its sturdy and rugged construction, lightweight, positive seal and minimum of working parts make this drain cock a possible must in all postwar water, fuel an hydraulic systems. For full information write the engineering department and indicate use or application desired.



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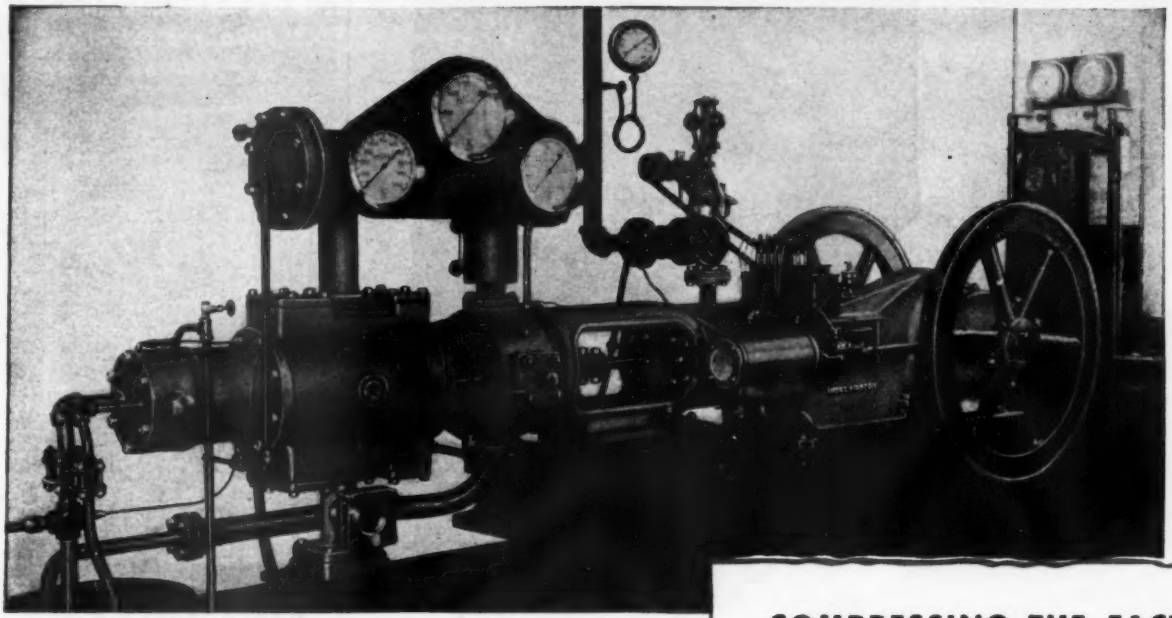


A Worthington Type HB3 single tandem three-stage compressor as installed in an important chemical plant.

With 2 Exclusive Worthington Compressor Advantages

No other three-stage high-pressure compressor can offer you these advantages:

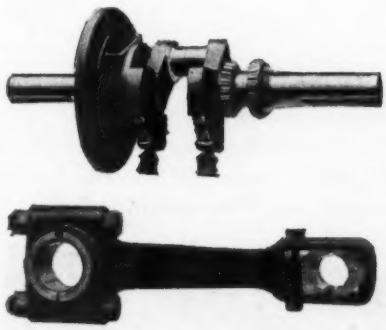
1. *Only one stuffing box*, and that subjected only to moderate pressures, minimizes leakage, so important when compressing costly or inflammable gases. Minimizes maintenance, too.

2. *Requires 20% less floor space*. Compact, without any distance pieces, the HB3 costs less in floor space and foundations than any other compressor of its kind.

Write: Worthington's Publications Department, Harrison, N. J. for Bulletin L-611-B12B, describing Worthington's exclusive Feather* Valves . . . automotive-type bearings and rods . . . steam and motor-driven HS and HB 3-stage models. *Worthington Pump and Machinery Corporation, Buffalo Compressor Division, Buffalo, N.Y.*

*Reg. U.S. Pat Off.

COMPRESSING THE FACTS



Worthington was first to use time-saving automotive-type bearings and rods on compressors, instead of old-fashioned wedge-adjustable design. *In 8 years of use, replacement of bushings has averaged only 1/10 of 1% in all HB machines installed!*

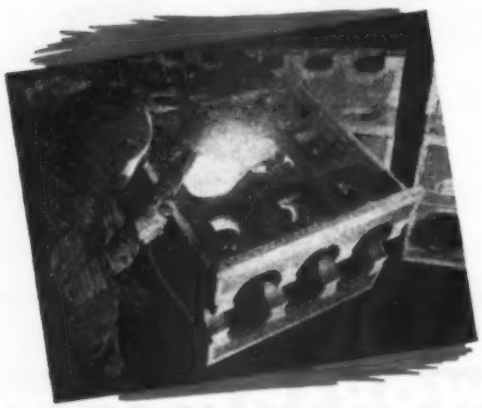
WORTH BEHIND THE NAME
WORTHINGTON

H4-21

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

If a carrier pidgeon could talk, what experiences he could relate, trained as he is to "Deliver".

If a complete roster of products and parts fabricated at United Welding since 1913 were compiled, what a welding story it would tell. They would include:



Horizontal press frames
Five station multiple drill bases
Multiple drill beds
Boring mill bases
Hydraulic press frames
Gear blanks
Gear guards
Mobile crane top decks
Crane center trucks
Diesel engine frames
Diesel engine gear housings
Blower impellers
Blower casings
Pressure vessels
Jib arms
Field rings
Exhaust manifolds for Diesels

FOR PAPER MILLS

Settling tanks	Tanks	Beater tubs	Pulleys, etc., in stainless
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Today-tomorrow-someday—you may require the experience, equipment and skill of responsible fabricating welders. When that day comes, submit your drawing for estimates or call a United engineer in consultation.

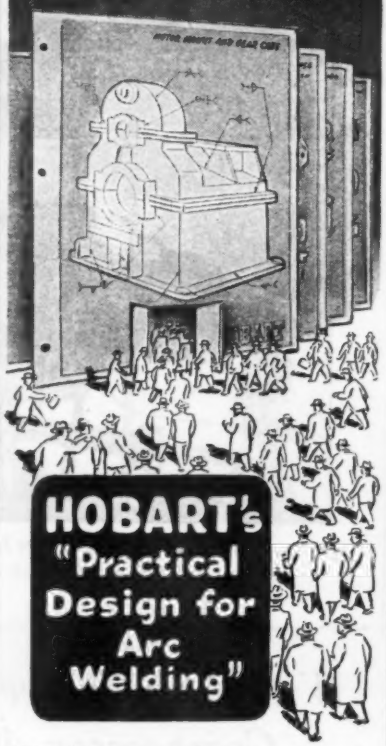
WELDING ENGINEERS · UWCO · MIDDLETOWN, OHIO

ARMY E NAVY

THE UNITED WELDING CO.
MIDDLETOWN, OHIO
WELDING FABRICATORS OF MODERN DESIGNS

JOIN THE THOUSANDS

who are enrolling for this service—



HOBART's "Practical Design for Arc Welding"

YES! Thousands of designers, engineers and manufacturers have acclaimed them a great contribution to industry. Hobart offers this service in cumulative, loose-leaf form to show you how to build hundreds of structures from standard shapes of steel together with forgings, castings, and press formed components, and then joined by Arc Welding into stronger, lighter products at lower costs.

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PROMPT DELIVERIES are assured on orders for Hobart "Simplified" Arc Welders, when accompanied by priority ratings. Write us for details.

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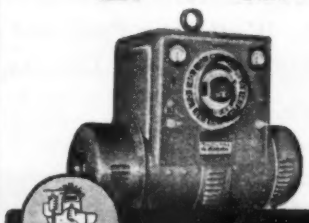
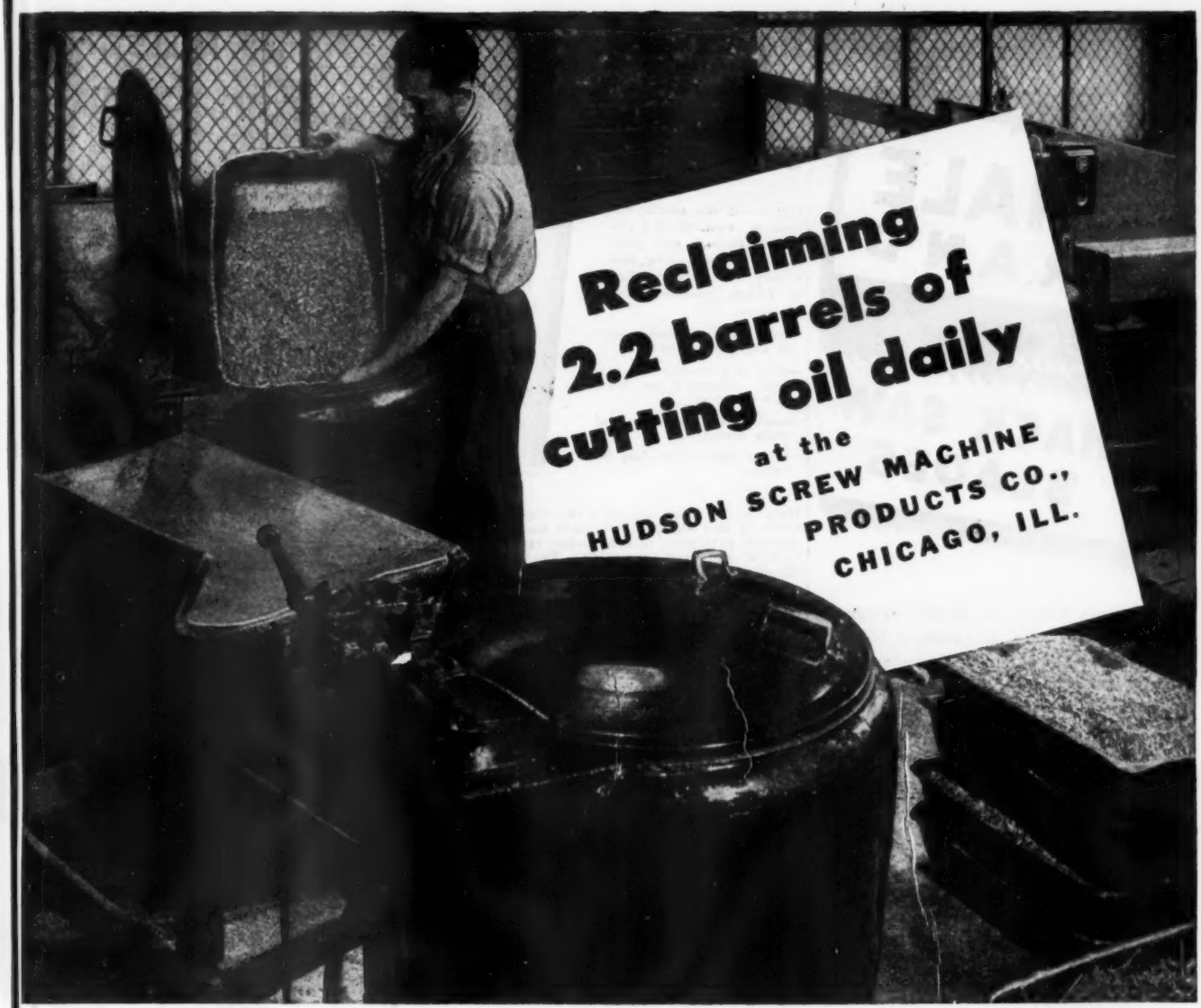


HOBART
"One of the World's Largest Builders of Arc Welders"



TOLHURST CHIP WRINGERS reclaim about 110 gallons of cutting oil every 24 hours from the chips of the Brown and Sharpe screw machines at the Hudson Screw Machine Products Company. Simple and rapid operation enables Hudson to run 10 to 12 loads per hour in each of their 3 Tolhurst Chip Wringers. Tolhurst "Chip Wringers" are capable of recovering as much as 98.6% of cutting oil — by centrifugal force only.

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CLEANER PLANT — Frequent collection and cleaning of chips result in neater floors, thereby reducing fire and personal accident hazards.

SAVE CUTTING OIL — SAVE METAL

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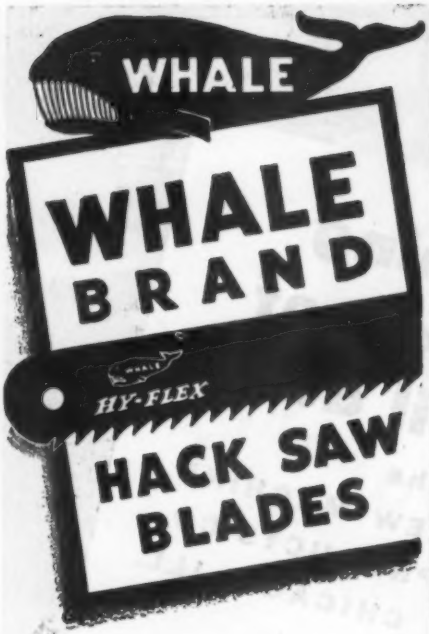
TOLHURST CHIP WRINGERS

TOLHURST CENTRIFUGAL DIVISION • ***American Machine and Metals, Inc., East Moline, Illinois***

"Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"



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Here's a Whale of a Blade of a special analysis molybdenum, high speed steel that gives unusual cutting service. Can be used at the same cutting speeds as tungsten and deliver practically equal performance. If you want outstanding results on stubborn cutting jobs, ask your mill supply house for WHALE BRAND HY-FLEX and MO-HY BLADES and you'll get it.

Get to know the satisfaction in WHALE BRAND HACK SAW BLADES and FRAMES • BAND SAWS • COPING SAW FRAMES and BLADES • SCREW DRIVERS • HAND DRILLS. Ask for the catalog that describes these and other good FORSBERG TOOLS.

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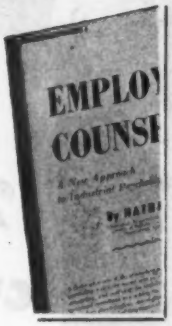
MFG. CO., BRIDGEPORT, CONN., U.S.A.

How to counsel employees with out-of-plant problems



Improving the employee's outlook, welfare, and efficiency, through new techniques of counseling that utilize the understanding of human problems and reactions.

—social and psychological theory of employee counseling

—scope and function of counselor, illustrated by actual case interviews

—qualifications, training, and skills needed

—how to conduct counseling interviews

Here for the first time is a thorough, penetrating study of this significant forward movement in industrial personnel relations—the rapidly growing field of employee counseling. This book defines the direction, scope, and value of employee counseling as a new approach to industrial psychology, describing its underlying social and psychological theory in clear, concrete, nontechnical language. The book illustrates with actual case examples how the trained consultant—by giving the employee an objective, understanding audience—helps the employee to adjust himself harmoniously to his job, and to clarify and resolve the deep-seated emotional problems that, whether he knows it or not, mar his efficiency on the job.

Just Out!

EMPLOYEE COUNSELING

By NATHANIEL CANTOR

Chairman, Department of Anthropology and Sociology, University of Buffalo

163 pages, 5¾ x 8¾, $2.00

By illustrating with actual case examples the function of the employee counselor, this book shows that effective employee cooperation depends upon understanding the social and psychological behavior—on the level of feelings, attitudes, and sentiments—of people who are on the job. In this book the author, as a sort of consultant's consultant, outlines the training and skills needed for the personnel consultant qualified to reach the real causes for employee dissatisfaction—most often, psychological problems involving the deeper emotions.

Presents:

- the development of the counseling program in American industry
- detailed description of the function and methods of the consultant
- a working psychology of the basic principles of human behavior needed for effective counseling
- illustrations of significant case histories
- an outline for the organization of the counseling staff
- discussion of the place of the counseling program in the plant

See it 10 days on approval

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Send me Cantor's Employee Counseling for 10 days' examination on approval. In 10 days I will send $2.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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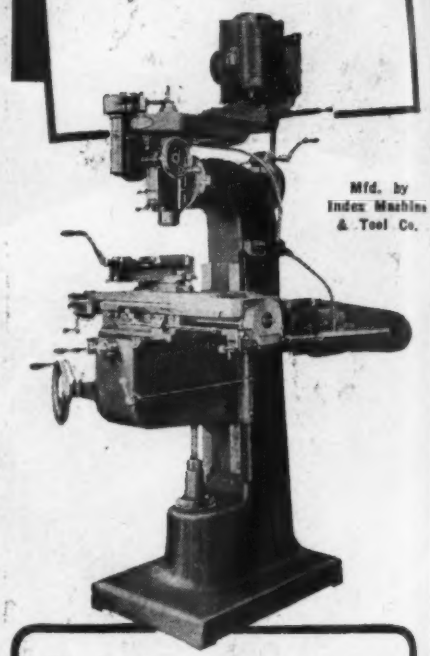
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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True to Form . . .

with JKS Diamond Tipped Dressing Tools

For truing and shaping a wheel to make its face concentric — to make its sides plane or parallel — to alter its shape for grinding special contours — there's a JKS diamond tipped tool. "True to Form" applies to these tools in another sense, for their performance is in keeping with the high standards for which all J. K. Smit & Sons diamonds and diamond tools are known.

CHISEL EDGE, a shaped and lapped diamond tool, is especially designed for form and radius dressing. Clearance, rake, hook and shear angle are given special study for every individual job.

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All tools are available with holders for standard makes of equipment.

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DIAMOND WHEELS • TOOLS FOR DRESSING WHEELS • CORE BITS • METAL WORKING TOOLS • POWDER

Thread Ring Gages *Re-worked!*

WORN GAGES MADE LIKE NEW!

SAVE time in getting Thread Ring Gages for rush work! Ship us your worn gages and let us give them a new lease of life! We re-lap the worn threads on pitch diameter, re-lap the major diameter to sharp V, eliminate bell-mouth, enlarge the slots and replace worn bushings, adjusting screws and locking nuts when necessary.

Unless the gages are so badly worn that they are hopeless, we make them as good as new—at a saving of 30% as compared with the cost of new gages.

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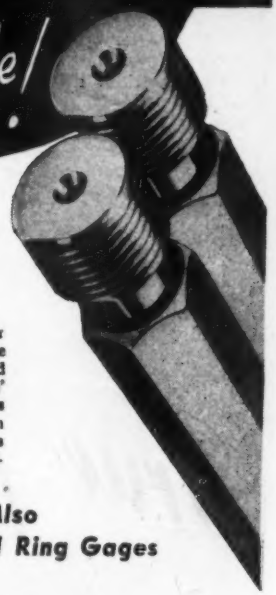
NOTE:

When sending special pitch-diameter gages, be sure to send also the setting plugs.

Thread Plug Gages *Now Available!*



PREPARE FOR RECONVERSION!

You can save valuable time in postwar days by taking time now to arrange for the thread plug gages you'll need for peacetime production. A few days' delay at this time may mean months of waiting in the postwar period when our plant becomes booked with orders to the limit of its capacity. All standard sizes now available.

Quick Delivery Also on Standard Ring Gages

Scientific GAGE COMPANY

15922 Fenkell **Detroit 27, Mich.**

A Flexible, Adaptable TAPPING MACHINE!

HANDLES A WIDE RANGE OF JOBS

In these quick-changing times a truly UNIVERSAL low-cost tapping machine is a real asset. The Procunier unit here illustrated, by interchanging two tapping heads will handle from a No. 2 tap up to a 5/16" tap in steel, 3/8" in cast iron and 1/2" in brass and aluminum. That means that in your shops one Procunier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Procunier high-speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages. Many other features.

Prompt Delivery—Send for Bulletin

giving full details and prices on Procunier Universal Tapping Machines. High Speed Tapping Head and Tru-Grip Tap Holder.

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14-18 S. Clinton St., Chicago, Ill.
Send me bulletins on ☐ Universal Tapping Machines. ☐ High Speed Tapping Heads. ☐ Tru-Grip Tap Holders.
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Tracer-Controlled MILLING

8 mm. movie camera case profiled in large quantities

TRACER CONTROL Proven FASTER METHOD FOR HIGH PRODUCTION PROFILING

High Accuracy and Finer Finish Maintained . . . Production Doubled

An American camera manufacturer found the Gorton Duplicator the ideal machine for high production profiling of both seat for cover and film tract clearance of camera cases, holding tolerances of ±.003". Gorton high spindle speeds produced the required fine finish.

SIMPLE HEAT-TREATED MASTER determines cutter path. For high production, pneumatic clamping provides easy loading and unloading and simultaneously regulates flow of coolant.

On jobs like this, the Gorton Duplicator permits any reasonably good operator to perform satisfactory work, maintaining high accuracy, comparable to results of highly skilled mechanics on special production equipment.

PRODUCTION DATA

Operation—Profiling to fine finish.
Material—Aluminum alloy.
Speed—4,000 r.p.m.
Feed—Manual.
Production—30 per hour.
Previous Method—15 per hour.

GORTON ENGINEERING SERVICE, FREE

Investigate the possibilities of the Gorton Duplicator as the practical, economical solution to your high production profiling problems. Gorton engineers who have specialized for 50 years in the development of tracer-controlled milling will give you their recommendations without obligation. Submit part, prints or specifications to your Gorton dealer, or Factory at Racine, Wis.

The *Right* Size The *Right* Type of Machine for Every Job . .

From 2 oz. to 2 ton

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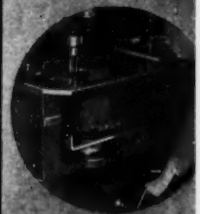

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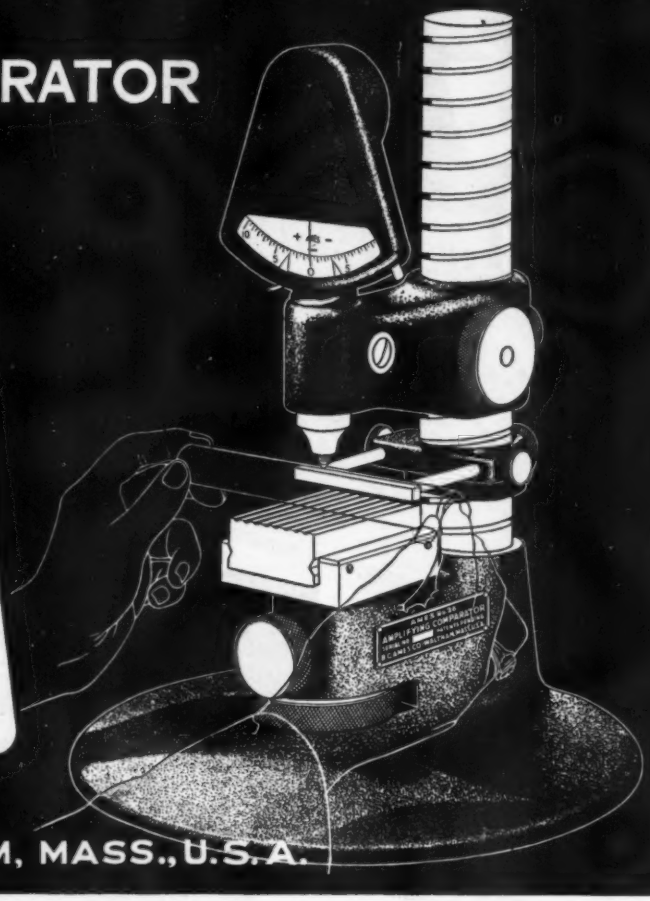
AMES No. 26 COMPARATOR

This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings.

The cast iron base supports the steel upright column, which is grooved to provide an adjustable stop for the indicator bracket. Fine adjustment of indicator is made by moving dial with outside lever. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

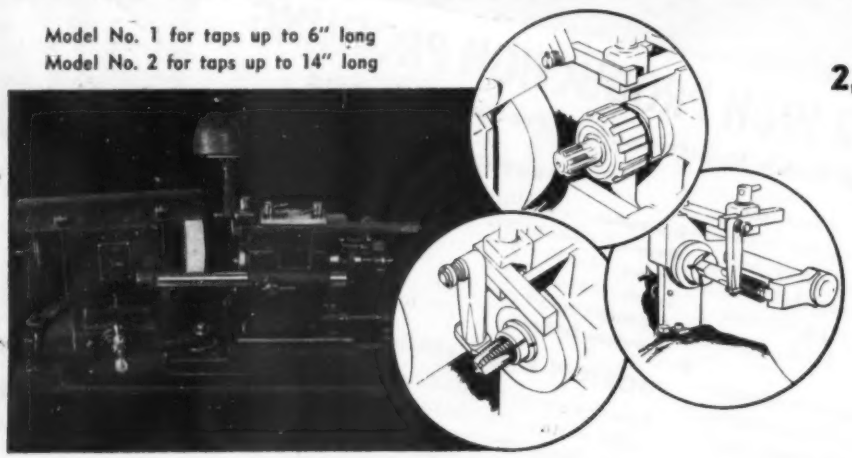
SPECIFICATIONS

Total height 15". Base diameter 11".
Total measuring capacity 6"
Fan Head total range .002"
Distance from contact to front of Post 3½"
Anvils 2⅛" x 3¼". Special anvils to order
Approximate weight 40 pounds



B. C. AMES CO., WALTHAM, MASS., U.S.A.

Model No. 1 for taps up to 6" long
Model No. 2 for taps up to 14" long



SHARPEN TAPS WITH 2, 3, 4, 5, 6, 8, or 10 FLUTES *EITHER* RIGHT- OR LEFT-HAND ON *ONE* MACHINE

The Blake Tap Grinder does *not* require attachments, special gearing or fixtures to change from right- to left-hand taps. This one machine will sharpen taps with 2, 3, 4, 5, 6, 8, or 10 flutes, and three methods are available for holding taps—(1) on centers, from No. 0 to 2"; (2) on the outside diameter of the thread, from No. 0 to ½"; (3) on the shank from No. 0 to ⅝".

With the Blake Tap Grinder you can easily and quickly grind any amount of relief desired. Keep taps at "original" sharpness with a Blake, because a dull tap wears rapidly.

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail.
A.M.

Name..... Title.....
Company.....
Street.....
City..... State.....

MORE SPEED *LESS* WHEEL WEAR

Another case of Lower Production Costs with CORTLAND CHUCKS and SEGMENTS

Another War Production Test proves Cortland Chuck and Segment superiority over competition. Here is the report:

TEST FACTS: A Southern oil tool manufacturer . . . using a Blanchard No. 16 Vertical Surface Grinder . . . Wheel Speed 860 R.P.M.

WORK: Cross and side cutters for rock bits . . . Tungsten carbide weld over NE8620 and NE9420 Steel . . . 7 pieces per table load; table feed 20 R.P.M.

TEST RESULTS

Detail	CORTLAND Chucks and Segments	*Competitive Brand Formerly Used*
Rate of Feed	Hand Feed	.008
Total Feed	.018	.022
Stock Removed	.016	.016
Wheel Wear	.002	.006
Dressings Necessary	None	2
Grinding Time	3 min.	17 min.

The wide variation between 3 minutes for Cortland and 17 minutes required by the competitive brand, proves the important function of Cortland Segment design: *Diagonal Shearing with Varying Contact.* Note also that in each case the segment wear would indicate a useful life for Cortland Segments three times as long as that of the brand formerly used. This cuts the cost of segments, and reduces production costs still further.

Why not make your own test of Cortland performance? Write for illustrated bulletin.

CORTLAND GRINDING WHEELS CORP.
5 Cortland Street **Chester, Massachusetts**

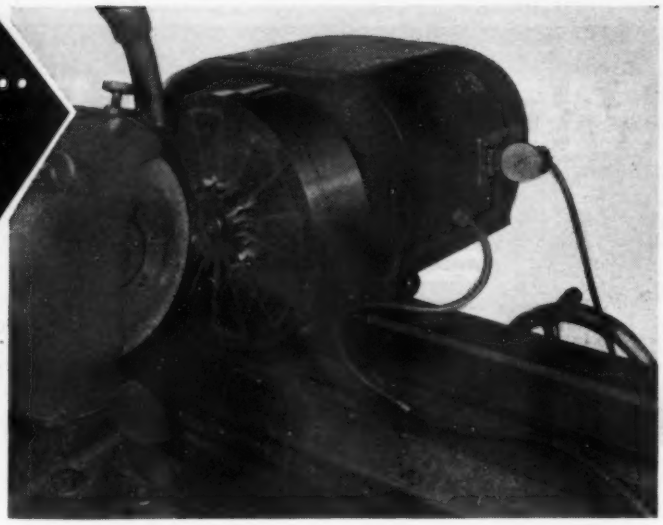
Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

"WALKERS" at work...

One of a series of advertisements showing specific applications of Walker Magnetic Chucks on specific machines.



Showing close-up of Walker Magnetic Chuck holding a rack gear cutter during face grinding on a Landis 10" x 24" Type CH Universal Grinder.

Precision calls for the WALKER MAGNETIC CHUCK

Where precision is required, there you'll find the "WALKER," as shown here on a Landis Grinder.

With WALKER magnetic holding devices, precision work can be obtained at lower costs, because WALKER MAGNETIC CHUCKS, the product of pioneers, have been carefully engineered for the applications intended. While most applications can be met with standard designs, Walker is prepared to furnish special chucks promptly for special needs.

All Walker Magnetic Chucks have been service proved.

Ask for further details. Put your holding problems in the hands of Walker engineers for prompt solution.

New and improved types now available include:

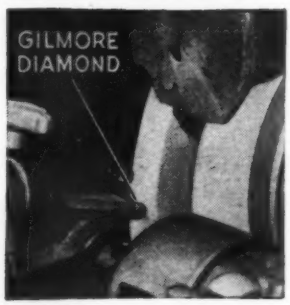
Longitudinal & Bar Electro-Magnetic Type which are abuse-proof and water-proof

Permanent Magnetic Chucks in Plain and Swivel types.

O. S. WALKER CO., INC.
Worcester, Mass.

GILMORE DIAMOND TOOLS

play an important part in truing the precision grinding wheels of leading shops



Gilmore service—in developing and furnishing Diamond Tools to meet the varied and extensive requirements of the metal working industries—is of accepted and recognized value. As specialists of long experience in the manufacture of Diamond Tools, and in diamond cutting, Gilmore has kept pace with grinding technique and its recent highly specialized demands.

The Gilmore line has been developed to meet the present needs of precision grinding and is complete with Diamond Tools to meet every dressing need for every type of wheel.

Investigate the scope of Gilmore service by sending for illustrated literature covering the Diamond Tools available from Gilmore. Outline your wheel dressing problem and ask Gilmore to recommend a solution.

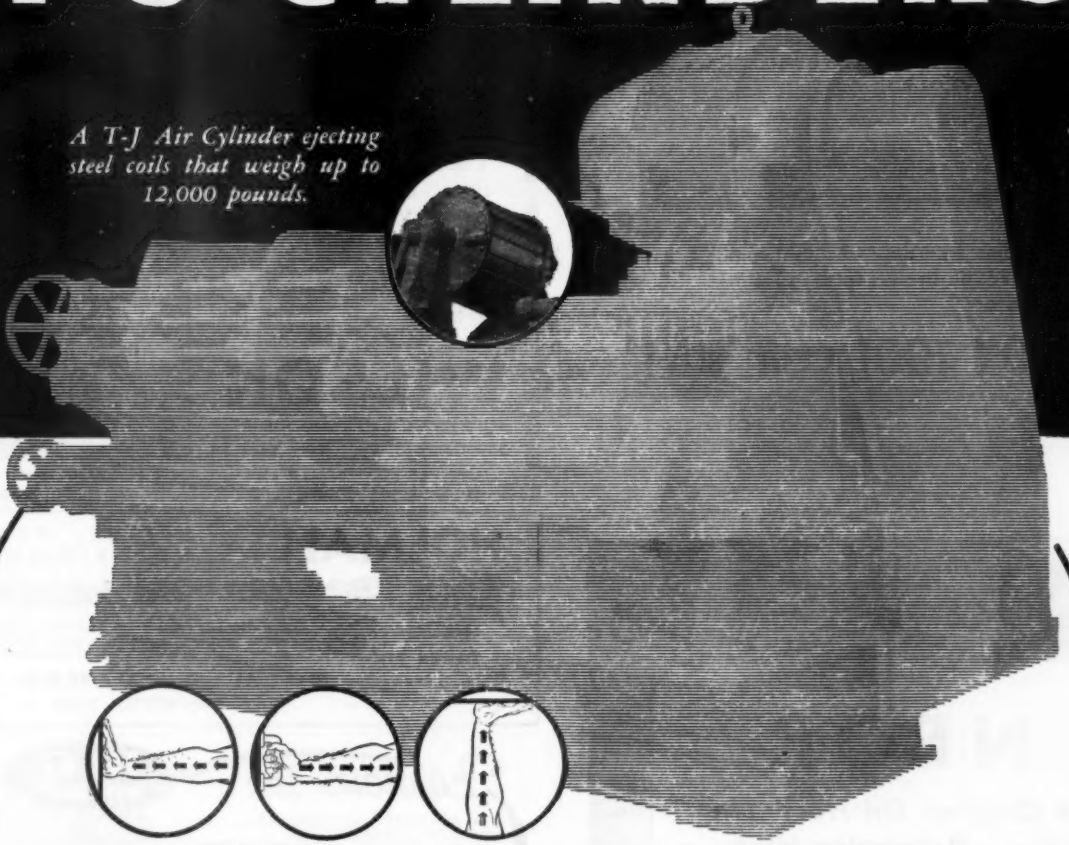
F. F. GILMORE & CO., 285 Columbus Ave., Boston, Mass.

Simplify Your Machines

...SPEED PRODUCTION WITH

T-J CYLINDERS

A T-J Air Cylinder ejecting steel coils that weigh up to 12,000 pounds.



FOR PUSH-PULL-LIFT JOBS...100 LB. OR 50,000 LB.

Harness T-J Cylinders to your tough jobs of power movement—to improve performance of machines and equipment!

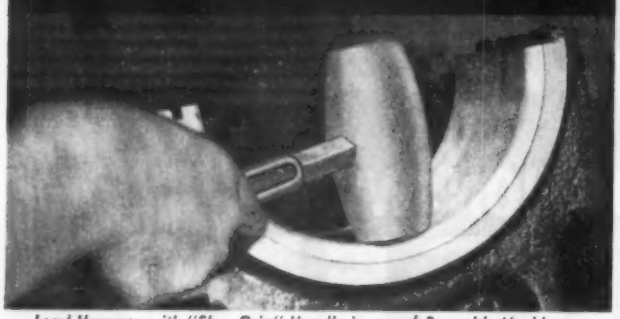
For presses—clutches—hoists—furnace and oven doors—material handling equipment—shears—damper regulation—and scores of other jobs where pushing, pulling or lifting is needed, use T-J Air and Hydraulic Cylinders! Available in many standard sizes and styles... both cushioned and non-cushioned types. These Cylinders are T-J engineered to deliver maximum power movement in every stroke... dependably...with long life. Write for latest catalogs.
The Tomkins-Johnson Co., 601 Mechanic Street,
Jackson, Michigan.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

The Tool with a Thousand Shop Uses!



Lead Hammer with "Shur-Grip" Handle in use at Reynolds Machinery Company, Ship Street Rebuilding Plant, Providence, Rhode Island.

Johnson "SHUR-GRIP" Lead Hammer!

Day in, day out, there are countless jobs that call for a lead hammer. To save precious man hours, many times lost through costly hammer slips, equip your shop or plant thoroughly with SAFE Johnson "Shur-Grip" hammers. "SHUR-GRIP" handles give user a "bulldog" grip and are almost indestructible.

"SHUR-GRIP" handles used only with Johnson 3, 4, 5 and 6 lb. lead hammers. For illustrated folder and price list, write Dept. A.M.

JOHNSON TOOL COMPANY

LAWRENCE H. COOK, OWNER

PLASTIC MOLDS—TOOLS

65 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

Darwin

NEOR

The Original Oil Hardening, Non - Deforming High Carbon - High Chrome Steel

NEOR is recognized as one of the finest high-carbon, high-chromium steels. For quantity production, NEOR is unsurpassed for dies. Retains a keen edge much longer than carbon or high speed steels. NEOR hardening penetrates to the center of the tool and is non-deforming.

Owing to its remarkable resistance to abrasion, NEOR is ideal for gages.

Furnished in Billets, Bar Stock and Drill Rod. Bulletin on Request.

DARWIN & MILNER Inc.

highest grade tool steels

1260 W. FOURTH ST. CLEVELAND 13, OHIO

RANDALL & STICKNEY

Universal Gauge

for rigid inspection of a wide range of parts . . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9¾"; weight 5 lbs. 1¼ oz.; depth from frame to spindle 1⅜".

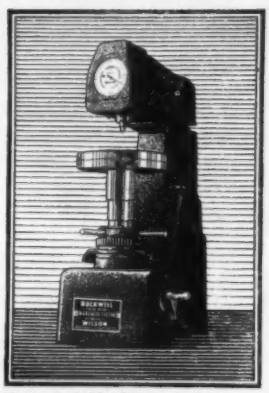
Can be supplied with sliding head and table; also on a stand with throat 3" deep.

Full details on request

RANDALL & STICKNEY

Makers *Waltham 54, Mass.*

"ROCKWELL" HARDNESS TESTER



These new, improved type testers available from stock in all sizes.

The word ROCKWELL has been our Trade Mark for 24 years and is the mark that insures precision.

WILSON

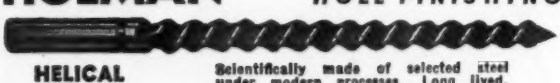
MECHANICAL INSTRUMENT CO. INC.

357 Concord Ave., New York 54

An Associate Company of American Chain & Cable Company, Inc.

HOLMAN

BETTER, FASTER HOLE FINISHING



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.

MANCHESTER, CONN.

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

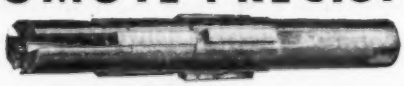
See our Advt. on page 259 Jan. 18, '45, American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.

Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

NICHOLSON *EXPANDING* MANDRELS

PROMOTE PRECISION



And, secondly, they CUT COSTS . . . two big reasons why Nicholson Expanding Mandrels are recognized as "standard" in the nation's machine shops. Set of 19 does the work of 209 solid arbors, for all bores from ½" to 7". Two types, all sizes; sold singly or in sets. Prompt delivery. Bulletin 1043.

Other Products: Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO. 114 OREGON STREET WILKES-BARRE, PA.

OPERATOR: ***"These flexible lines don't break, Fred."***

FOREMAN: ***"No! Not since we changed to Titeflex."***

That's the real test of flexible tubing — the length of time it stays on the job — takes constant punishment *without* breakage, *without* leakage — *without* the need for replacement.

And that's the big reason Titeflex is replacing so many types of flexible tubing on so many types of machines.

Illustrated above is a Titeflex line utilized for compressed air on a punch press. But whether your lines convey oil, coolant, water, chemicals, or air — Titeflex will last longer on the job.

What makes Titeflex better? First, of course, the fact that it's *all-metal,* and accordingly is not affected by heat, by cold, or by most corrosive materials. But remember, to this all metal construction, Titeflex adds two exclusive virtues:

• Titeflex provides not one but four thicknesses of metal at the point of greatest wear. That means greater durability.

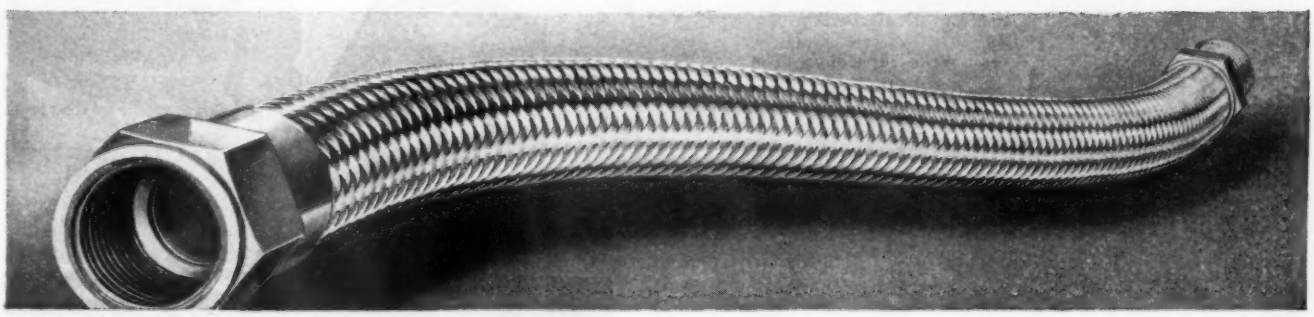
• Titeflex metal braiding is woven directly onto the tubing as it is made — never slipped on afterwards. That means greater ability to withstand high pressures, greater protection against elongation.

You'll find Titeflex all-metal tubing available in sizes and types to meet every equipment need. Catalog No. 113 gives the information and data you need — both for your present war-time production, and for your post-war planning. May we send your copy — now?

TITEFLEX, INC., 535 Frelinghuysen Ave.
Newark 5, N. J.

ARMY (E) NAVY

Titeflex

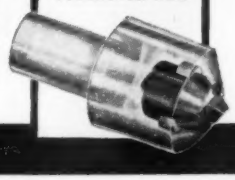


DIAMONDS for Production

Actual Size Photo
3 Carat Size—Common
¼" Shank—$36.00 ea.

RE-SET-ABLE • BIG-HED-NIB
(Trade Marks Registered)

Equip Now with "RE-SET-ABLE"
Diamond Tools on Your Precision Grinding Production Line



LOC-KEY-SET
by Patented Process
U. S. Pat. 2,351,741

16
Factory Branches
Jobbers Everywhere

- **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.

No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of ⅛ carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

DIAMOND TOOL COMPANY, Not Inc. SHELDON M. BOOTH, Pres. 938 E. 41st Street CHICAGO 15, Ill.

. . . for better machining of tough materials—

• Each machining job is different. ThredKut 99 can be used straight or diluted to fit job requirements. Stuart Oil Engineers, "skilled in the art" can adapt this perfectly balanced heavy duty cutting oil to give the results you are looking for. D. A. Stuart Oil Co., Limited, 2729 So. Troy Street, Chicago 23, Illinois.

Stuart's ThredKut 99
SPECIAL CUTTING OIL

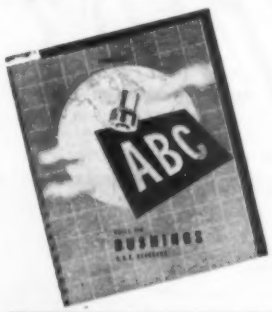
D.A. Stuart Oil CO. LIMITED
ESTABLISHED 1865

FOR ALL CUTTING FLUID PROBLEMS
Stocks in All Principal Metal Working Centers

ABC TRADE MARK

DRILL JIG BUSHINGS

IMMEDIATE SHIPMENT FROM STOCK



Precision made from high grade tool steel and carefully heat-treated.

A.S.A. Standard in HEAD PRESS FIT, HEADLESS PRESS FIT, FIXED RENEWABLE, SLIP RENEWABLE types and HEADLESS LINERS. Also complete accessories.

Write for Catalog No. 243

MAIL COUPON TODAY

ACCURATE BUSHING CO., 440 North Ave., Garwood, N. J.
Kindly send me FREE catalog describing A.B.C. Drill Jig Bushings.

Name .....
Position .....
Company .....
Address .....

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don't be a put-er off-er

ORDER TODAY OUR NEW "O-P" ANGLEFEED FIXTURE
TABLE TRAVEL THREE AND ONE HALF INCHES

Our NEW "O-P" ANGLEFEED FIXTURE is a POST-WAR PRODUCT — designed for cutting down costs — meet competition, in the tomorrow. This NEW ANGLEFEED FIXTURE has a table travel of three and one half inches, and is adjustable to any desired angle within a few seconds. It can be quickly mounted to the table of any Shaper, Drill Press, Jig Borer, Boring Mill, Horizontal or Vertical Milling Machine or Surface Grinder. The NEW "O-P" ANGLEFEED FIXTURE is a great timesaver. Don't be a — put-er off-er — order now.

PATENT NO. 2329135

WRITE FOR THIS FOUR PAGE DETAILED FOLDER

POST-WAR SHOWING

AUTOMATIC MACHINE & TOOL CO.
ENGINEERED PRODUCTS
AUBURNDALE, MASSACHUSETTS

132 CHARLES STREET, AUBURNDALE, MASS.

PAGE *Welding* ELECTRODES

WHY WELDERS TAKE PAGE QUALITY FOR GRANTED

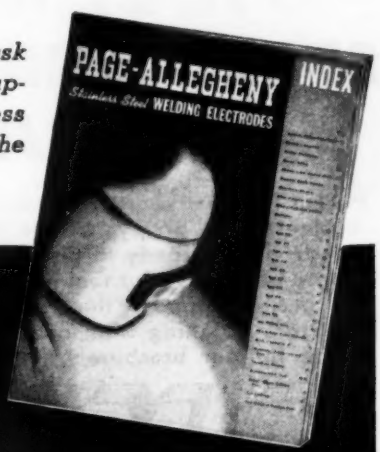
For the ticklish welding job—or any welding job for that matter—good results demand uniform electrodes.

PAGE believes that there is only one way to get real uniformity. And that is by rigid factory control of analyses, wire drawing and coating—constant factory test of welding results.

That's the **PAGE** way of making electrodes. And that's why those who know and use them take **PAGE** quality and uniformity for granted.

PAGE offers a wide range of electrodes and gas welding rods. Your **PAGE** distributor offers you the advantage of long experience in selecting the one best rod for each job.

Call your **PAGE** *distributor and ask for a copy of this new, informative, up-to-date booklet on welding stainless steel. Or, if you prefer, write to the factory for your copy.*

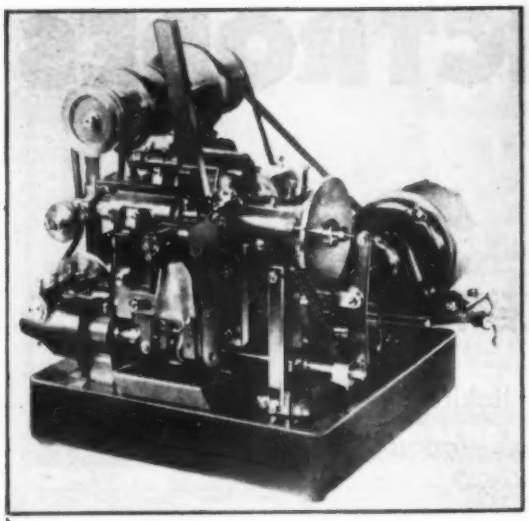


. . . Get in touch with Page

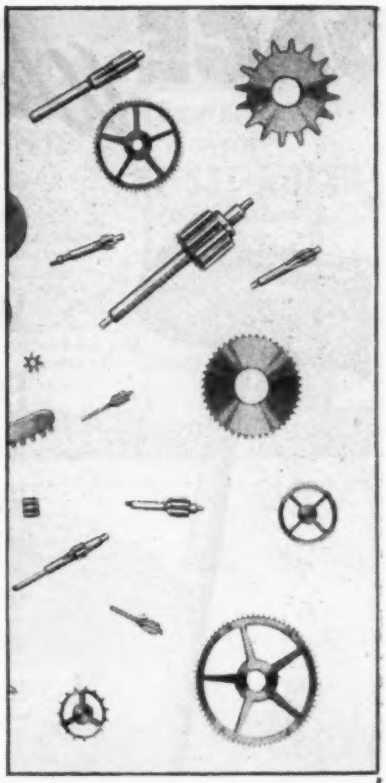
ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE



HIGH PRECISION PRODUCTION . . . *assured by* WALTHAM PINION AND GEAR CUTTERS



Small parts are cut to tool room standards of precision on these WALTHAM machines which are available in single-cut, multiple-cut and magazine-feed types. The typical parts for watches, meters, time fuses, instruments, gauges, etc., shown here give an idea of the wide range of parts which can be cut to high precision on Waltham machines.

As in all Waltham machines, a revolving cutter makes successive cuts held and indexed by work spindle. Operation is extremely simple and no special skill is required to cut pinions and gears to rigid specifications.

Send at once for complete details.

SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.) — ½".
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .24" to .45".
Strokes of work slide for stocked gears .85" to 1".
Bench space (countershaft drive) 19" x 18".
Bench space (motor drive) 26" x 25".

GEAR MACHINES

Pitch diameter, capacity 1½".
Strokes for work slide: 40", .65", 1.00", 1.25".

WALTHAM MACHINE WORKS WALTHAM MASS. WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

TOOLING FOR SPEED AND ACCURACY

★ For fourteen years tool making has been our business—and always will be. Our engineering department is ready to discuss your present or future problems—our tool making shop—one of the best equipped in the world—will build any size tool weighing from a few ounces to tons. Write for our brochure "Men and Machines."

A.W. HECKER

ENGINEERS *and Tool Makers*

Established 1931

1968 E. 66th ST., CLEVELAND 3, OHIO • OFFICES IN PRINCIPAL CITIES

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

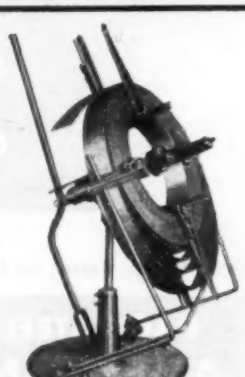
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips—MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

Let's

BACK THE ATTACK

***By Buying* WAR BONDS**



No. 3 Littell Reel. Capacity, 300 lbs.

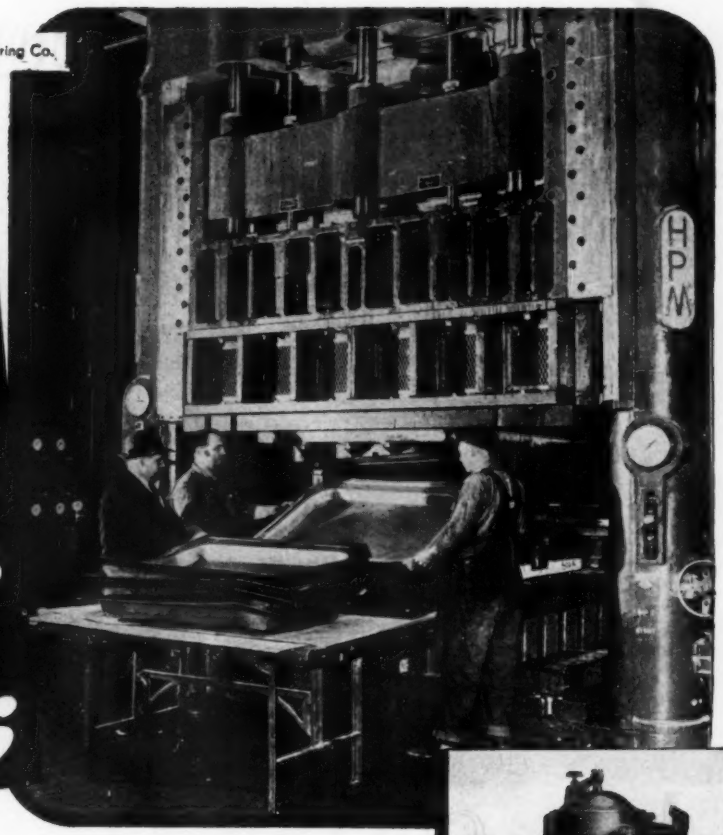
Reel-Off Coil Stock Faster at Less Cost with LITTELL REELS

COIL feeding with LITTELL Automatic Centering Reels increases production, lessens waste, improves quality, loads easier. Littell Reels are made in plain or motor-driven types for handling coils 100 to 20,000 lbs. Littell also makes Roll Feeds, Straighteners, Safety Feeders, etc.

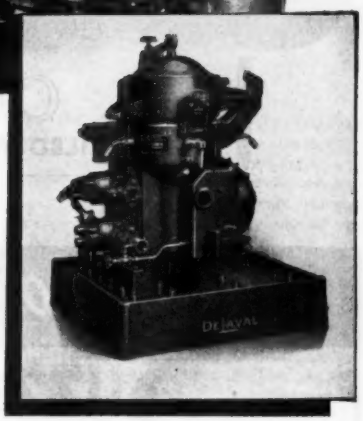
Send for Bulletins

F. J. LITTELL MACHINE CO.
4169 Ravenswood Ave.,
Chicago 13, Ill.

Photograph courtesy
Hydraulic Press Manufacturing Co.



Even a little CONDENSATE in Hydraulic oils is DANGEROUS



. . . CENTRIFUGE IT OUT *with a* DE LAVAL!

UNLESS condensate that gets into hydraulic oil is promptly removed, it tends to form rust which will ruin hydraulic pumps, valves and other control mechanism in the operating circuit. Even a very little water may cause a valve to stick, both in large presses and in hydraulic systems used to actuate automatic machine tools.

De Laval Oil Purifiers provide the *most complete protection* against the troubles caused by moisture in hydraulic oils, for in addition to continuously removing water, De Laval machines likewise unfailingly remove any sludge or other foreign particles that may be present. Oil purified continuously by De Laval can be used with "new-oil" safety and effectiveness practically indefinitely.

Hydraulic oil is but one of many types of factory oil that can be maintained at its best by means of De Laval Oil Purifiers. Cutting oil . . . grinding coolant . . . washing oils . . . honing oils . . . lubricating oil . . . and many others may profitably be purified by De Laval centrifugal machines.

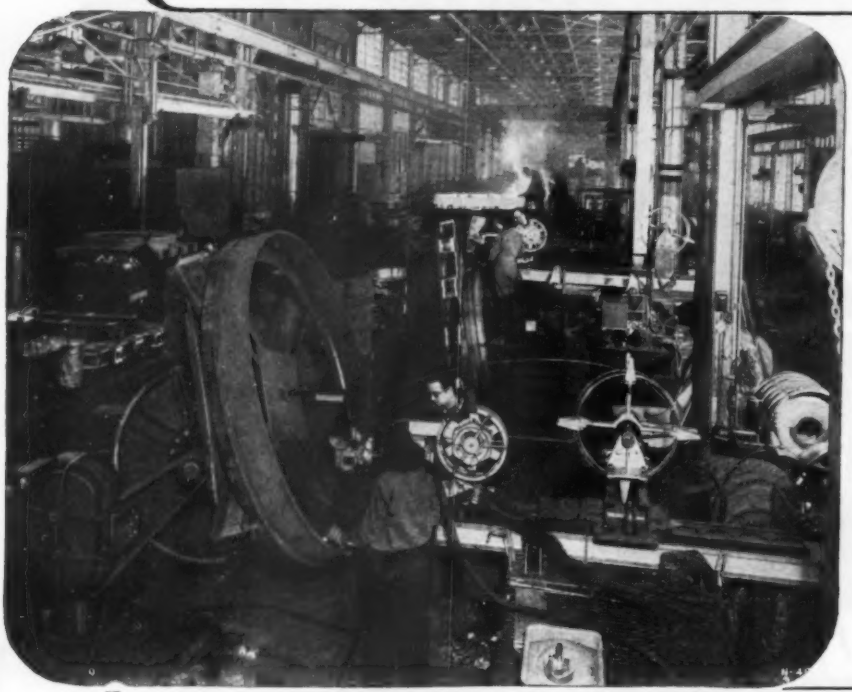
● For additional details, write for Bulletin FF 25.

DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

C-F POSITIONERS



PRODUCTION WELDING WILL BE AUTOMATIC—ON C-F POSITIONERS

Wartime advancement in *automatic* welding makes certain its wide use as a standard production method in postwar manufacturing. As now, much of it will be done on C-F Positioners, because: (1st) They permit a down hand weld on all sides with but one set-up—rotate 360°, tilt to 135° beyond horizontal under push button control. (2nd) The exclusive C-F variable-speed drive which will give table rotational speeds from 0 r.p.m. up. (3rd) C-F positioners come in sizes and capacities for every weldment—are universal tools equally efficient for job work or the production line.

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NO BLOWER or POWER NECESSARY
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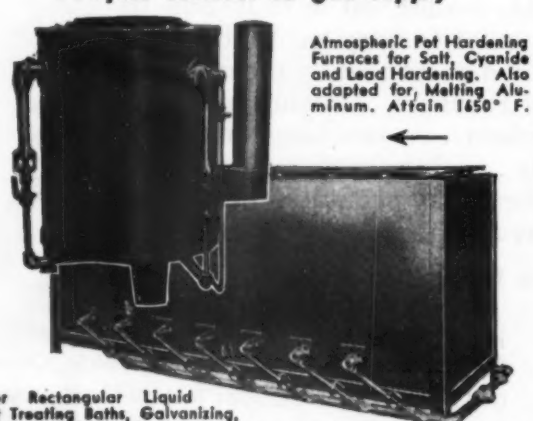

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The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

2615-6 Madison Rd.

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

An advertisement designed as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All such questions will be answered by mail or in subsequent advertisements. No identities will be revealed if published.

Question No. 1: *"We are doing a cylindrical grinding job and think the wheels we are using are a little on the 'soft side' for this work. Is there any way to make these wheels act harder?"*

Answer: Try decreasing the work speed (not wheel speed). This usually makes a wheel act somewhat harder and may enable you to use up your present wheel stocks.

* * *

Question No. 2: *"Is there any certain point where a wheel should be tapped to tell whether or not it is cracked?"*

Answer: Yes. With the wooden handle of a screw driver tap the wheel lightly at a spot about 45 degrees on either side of the vertical diameter.

* * *

Question No. 3: *"Is there any difference in the cutting action of a wheel as it wears smaller?"*

Answer: As a grinding wheel wears smaller its cutting action tends to act softer. It also requires more frequent truing.

* * *

Question No. 4: *"Please recommend a good 'general purpose' wheel for a Model B, Thompson surface grinder. We want a wheel that can be used for grinding both mild and hardened steel and that will give a fairly good finish."*

Answer: For the kind of machine you mention, one of the best "general purpose" wheels I know of is our 8A-46 K-15-V-25 Dayton (old marking 846 K-1-V). Processed of size 46 Dayton Refined Aluminus Oxide grain, with a vitrified bond and of very open structure, this wheel does a very good grinding job on a wide range of materials. It cuts fast and cool; gives an excellent finish; requires a minimum of dressing; wears at just about the right rate for efficient cutting action.

* * *

Question No. 5: *"We have a new grinding job that requires a high finish, but all too frequently scratches appear on the finished part. Could this be the fault of the wheels we are using?"*

Answer: I doubt very much whether such scratching is the fault of the wheels as all wheel manufacturers take the utmost precautions to prevent the inclusion of any foreign materials or larger grain sizes than those specified from getting into the wheel. In all probability the scratching is due to small particles getting into the coolant. I suggest you take steps to see that the coolant is properly filtered and also that the tank is frequently cleaned.

* * *

Question No. 6: *"Which is the most important—the pressure of a coolant at the point of contact between the wheel and the work, or the volume of coolant "*

Answer: Since the chief function of a coolant is to dissipate heat, it naturally follows that the more coolant you use the more heat it will dissipate and carry away. Hence, the volume of coolant used is more important than the pressure employed.

* * *

Question No. 7: *"Does the shape of the material to be ground have any bearing on the work-speed?"*

Answer: The shape of the piece to be ground has a lot to do with the work-speed. If the pieces are irregularly shaped, such as camshafts, the work-speed must necessarily be slow in order to follow the track. For rough grinding, an F.P.M. somewhere between 15 to 30 is usually the most efficient work-speed, whereas for finish grinding the work speed is reduced to 10 to 15 F.P.M.

* * *

Question No. 8: *"Is there any rule to determine the number of steady-rests to use in cylindrical grinding?"*

Answer: A very practical rule in this regard is to use from six to ten diameters of the work as the spacing between rests. This is an especially good rule when grinding long and thin work. But no matter how thick and short the work may be, it does no harm to use at least one rest as it will prevent vibration when heavy cuts and rapid table feeds are used.

* * *

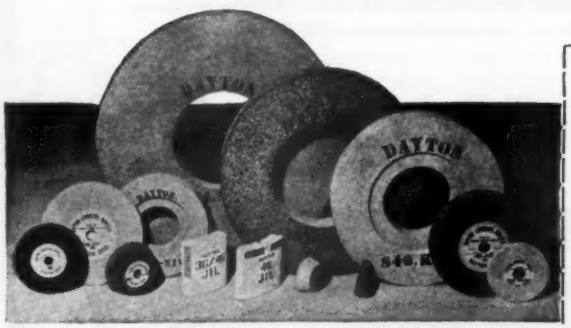
Question No. 9: *"We are grinding hardened steel parts for use on a gun mount. The wheel we have been using is a soft, vitrified wheel, 46 grit. It has done a good job. But recently, there are chatter marks on the work. What could be the cause of this?"*

Answer: Since the chatter marks is a recent development, I think the wheel you are using can be eliminated as a possible source of the trouble. Suggest you check the machine itself and the headstock for vibration. Usually, if the chatter marks are fine, it will be found that the entire machine is vibrating excessively. If the chatter marks are somewhat coarse, are spaced evenly, and run longitudinally, the vibration can be traced to the headstock.

* * *

NOTE: A durable, neatly bound portfolio containing reprint of these and scores of other "Answers" to everyday grinding problems will be sent FREE to anyone interested in better grinding practices. Just fill-in and mail coupon below. SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.

DAYTON GRINDING WHEELS



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Winter

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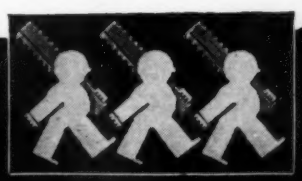

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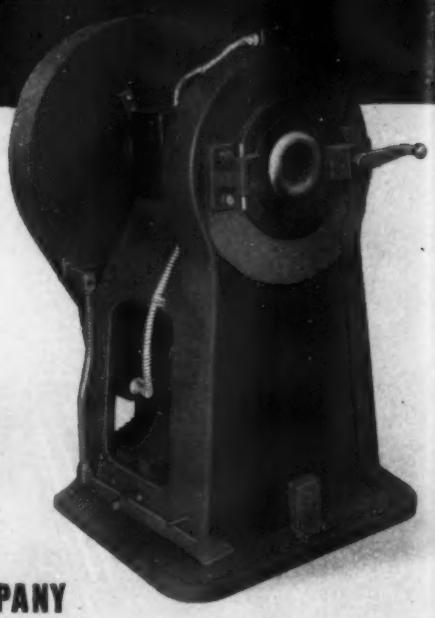

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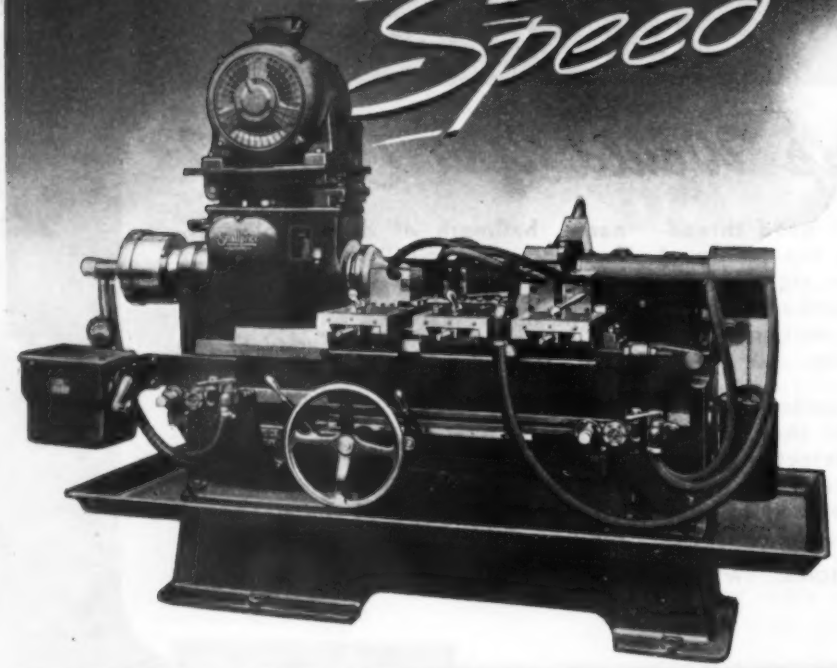

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The Smallpeice Production Lathe spells equal success for either peace or war manufacturing. It is the ideal production machine for every type of regular turning, boring, facing and profiling—with a versatility that means a fine investment.

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1. Coil wound in Bakelite Varnish bath.
2. Thin layer of cotton tape applied.
3. Placed in special vacuum chamber under pressure. Vacuum is relaxed and pressure applied.
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5. When cool, coil is wrapped with layer of Varnished Cambric; dipped in Bakelite Varnish and baked.
6. Coil sealed into plastic cover; assembly again evacuated. Vacuum relaxed with dry air and cover hermetically sealed.

* Patent Applied For

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

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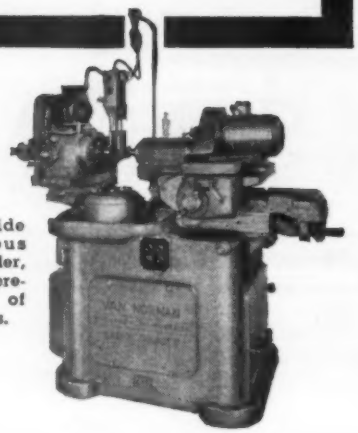
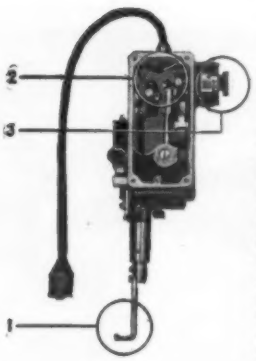
BIG RAPIDS, MICHIGAN U.S.A.

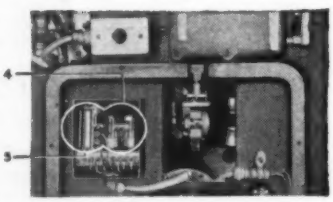
How Electronic Switching Keeps VAN NORMAN GRINDERS at Micrometer Precision



Van Norman Wide Angle Continuous Feed Radius Grinder, used for high precision grinding of ball bearing races.



The "finger" (1) of this control head contacts the ball bearing race, mechanically closing the switch (2) when the proper depth has been reached. Thus constant precision of measurement within .0003 of an inch is maintained. This depth is set by the operator, on the vernier type dial (3). Only a tiny current flows through the switch, since heavier currents would cause arcing or pitting of contacts, either of which would destroy the high accuracy of control necessary in this machine.



The current flowing through the switch in the photograph to the right is applied to an electronic tube (4) of the United Cinephone electronic switch. Only 3/1,000,000 ampere actuates this tube, which in turn operates a relay (5). By means of an auxiliary relay, full current is then instantaneously applied to the machine controls.

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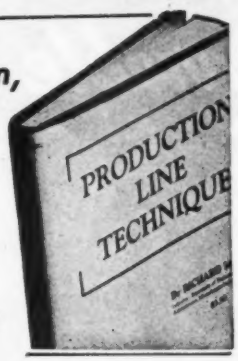
Get the facts on line production

for precision, quantity, low cost in small industry



This book gives you the fundamentals of production line technique—how it differs from job-lot manufacture, its advantages and limitations, how production lines may be set up and successfully operated in medium-sized industries. Based on first-hand field investigations of current practices in many manufacturing plants. A sound, practical guide to the steps to follow in design, procedure, equipment, and maintenance of production lines . . . the pitfalls to avoid . . . and the special features to consider, in establishing smooth-running, well-balanced, *profitable* production lines.

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Department of Engineering Administration, Massachusetts Institute of Technology

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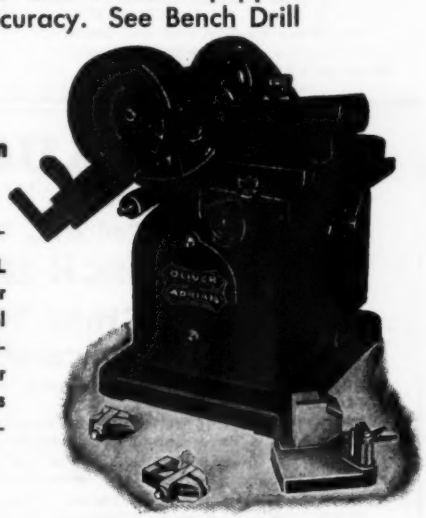

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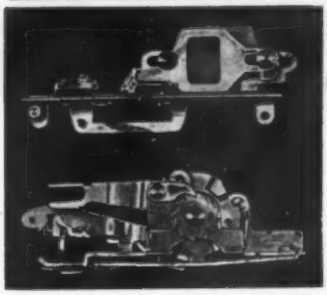

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330 W. 42nd St., New York 18, N. Y.

POSITION VACANT

Exceptional opportunity for right man. Large machine tool distributor in Chicago District needs experienced machine tool correspondent. Write giving full particulars, experience, age, etc.

P-173, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Illinois

WANTED

TOOL DESIGNER

Long established company in a New Jersey city 35 miles from New York, requires the services of a tool designer who is able to design without supervision. This is a permanent position with good opportunities. Write full particulars in first letter giving age, experience, lengths of service, and salary expected.

P-215, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (Essential Products) has opening for mechanical engineer with some machine design factory layout and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. Address P-956, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DRAFTSMAN EXPERIENCED with drawing dies, tool and jig layout, post-war positions, excellent conditions. P-164, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL AND diemakers experienced with drawing dies for post-war position, excellent conditions; give full particulars. P-163, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER—Old established company now converted to pre-war production (essential products) has opening for mechanical engineer with some machine design, factory lay-out, and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. P-205, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL DESIGNERS, Machine Designers, Detailers for Nationally known, long established manufacturer of tools, jigs, fixtures, gages and special machinery. Plant located in northern Ohio. P-220, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

WORKS MANAGER plant or factory manager. American, 49 years. Wide and varied experience in aircraft, automotive, machine tools, machine and die making, general jobbing. Held positions as plant and factory manager, general superintendent; master mechanic, tool superintendent, strong and rapid increase in production. Practical tool and diemaker, technical education. Thoroughly versed on handling organized labor, grievances and negotiated contracts. Last two positions have tripled gross output. Am now employed. Right connection more desirable than salary. PW-186, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MANAGEMENT EXECUTIVE AVAILABLE

Desires association as Department Director or Assistant to busy executive in Manufacturing-Industry field. Experienced in general administration, production planning, scheduling, and control. Experienced in the presentation of brief reports and outlining procedures for the purpose of economical manufacturing costs.

PW-223, AMERICAN MACHINIST
520 North Michigan Avenue, Chicago 11, Illinois

TO ABLE, AMBITIOUS MEN

In Engineering, Manufacturing, Sales & Administration, we offer, AT NO CHARGE, a confidential, dignified opportunity of bringing their qualifications before interested employers. Inquiries from management for key men are invited on a retainer or fee basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

POSITIONS WANTED

MANUFACTURING EXECUTIVE: Thoroughly familiar with all phases of modern high quality, high quantity, low cost production. Automotive background and training. Excellent war record managing plant producing gyroscopic fire control instruments and all types of electrical devices. Age 50. Available April. PW-206, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER with 28 years' executive experience. Successfully filled such capacities as Chief Engineer, tGeneral Superintendent and Works Manager. Well versed in modern manufacturing methods and equipment. Past connections with large well known concerns producing such products as sewing machines, machine tools, automobiles, aircraft and aircraft engines. Responsible position desired in Eastern location. PW-219, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MANUFACTURING EXECUTIVE, M. E.-E. E. Extensive knowledge of all phases of metal fabrication and line assemblies of products made from same. Excellent background in the manufacture of small and large precision work such as special machinery, machine tool accessories, electrical devices and time apparatus. Exceptional record of personnel administration. Fine background of sales, cost, personnel work, job evaluation and analysis also. Graduate engineer, aged 50 years. Position of General or Works Manager desired with company having post-war future. PW-218, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINE DESIGNER. Twenty years' experience in design machine tools and special machinery. Seeks position as designer or chief engineer preferably with small or medium sized concern offering continued post-war employment. Willing locate anywhere. Married. Draft exempt. Excellent references. PW-213, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALES ENGINEER available having engineering and shop background and experienced in the selling of machine tools and small tools. Pleasing personality, tactful, aggressive. Excellent sales correspondent. No objection to location or extensive travelling. Draft exempt. Desires personal interview leading to position of sales engineer or district office manager. PW-214, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALESMAN AVAILABLE

BRITISH MACHINE Tool Engineer, Age 39, wishes to represent American Machine Tool manufacturer in British Isles and Continental Europe. 23 years' experience with leading British Machine Tool manufacturer—demonstration, sales and service throughout Europe. Three years resident Sales and Service Engineer in Scandinavian countries. Last ten years travelled British Isles as specialist Sales Engineer. SA-217, American Machinist, 330 W. 42nd St., New York, 18, N. Y.

(Continued on the following page)

PACIFIC NORTHWEST AND ROCKY MOUNTAIN STATES

An Able and Active Agency
Established Connections
Complete and Faithful Coverage:
Industrial — Hardware — Automotive

FREDERICK JOHNSON COMPANY
Manufacturers' Agents since 1929

Branch **Denver, Colo.** — ***Terminal Sales Bldg.*** **Seattle, Wash.**

SALES OFFICE AND PERSONNEL AVAILABLE

Desires connection with well established company whose product must be handled by technically trained men. Office located in industrial center of Michigan. Will cover all middle west states if necessary.

SA-179, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Illinois

Auction Advertising—see opposite page

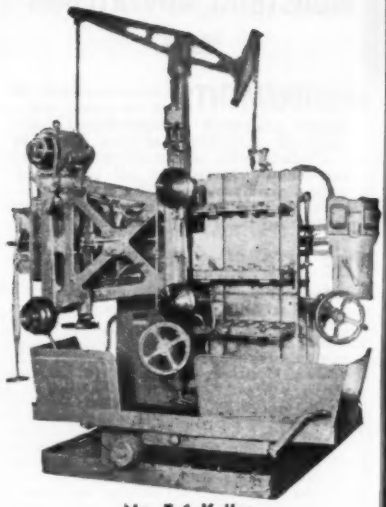
KELLER DIE SINKERS

FOR IMMEDIATE DELIVERY

No. BG-724 Keller Automatic Profiler for Die Sinking, Milling and Profiling

EMERMAN MACHINERY CORP.

875 W. 120th St.
CHICAGO 43, ILLINOIS



No. E-6 Keller Die Sinker

Die capacity — face 88" x 48" depth with standard table 30" depth with extension table 58"
Head vertical travel 48"; horizontal travel 72"
Spindle head travel 18"
Maximum reach of spindle 24"
Center distance between cutter and spindle tracer max. 50½"; min. 35½".
Working surface standard table 88" x 30"
Working surface extension table 88" x 58"
Equipped with panel board and switch boxes
Vertical feed drive motor—¾ HP. 110 volts, vary RPM, Ohio D.C.
Cutter spindle motor—2 HP. 115 volts, Gen. Elec. D.C. motor
Column drive motor—⅝ HP. intermittent duty, 115 volts, G.E. D.C.
Horizontal traverse motor—⅛ HP. 115 volts, Ohio D.C.
Weight approx. 16,500#

Die capacity 20" x 27" face x 12" high
Work table 20" x 50"
Cross slide travel 24"—.002" to .040" feed
Table speeds 4" to 24" per minute
Distance between 24"
Spindle speeds 620 to 3600 RPM.
Complete with motors, coolant system and splash guards
Weight approx. 6850#

3 AVAILABLE IN STOCK

(Continued from page 367)

REPRESENTATIVE AVAILABLE

FACTORY REPRESENTATIVE desires additional lines of merit, cutters, gauges, small tools. New York Metropolitan area, technical background. RA-221, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITIES

PATENT FOR Sale Car Heater—the most simple, efficient, and inexpensive to manufacture. Further details write V. Turdin, Hope Hill Road, Wallingford, Conn.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453,815-15th St., N. W., Washington 5, D. C.

GREAT OPPORTUNITY

Will sell to those seeking Product for Post-War Manufacture, a Patent pending simply designed "Metal Turning Tool" for brass.

BO-222, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE

Very prosperous precision tool and stamping plant established forty years, doing an annual business of about $500,000.00 with a better outlook on post-war business. Located south central part of New York State. Manufacturing Jigs, Fixtures, Dies and Gages of every description and equipped with presses of various sizes, doing a very profitable business on metal stamping. Selling price at gross profit for the past year. Building floor space about 9,000 square feet. Also a plot of about 17,000 square feet.

BO-216, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED TO BUY

Principals, long established and experienced in machine shop business are interested in buying for cash any established manufacturing business.

We prefer such opportunities where, after sale, personnel will remain and where the present owner will continue to supervise production at an attractive salary. We would furnish overall management, supply orders, new equipment, capital, etc. Send brief description of product and activity with first letter.

Area within 30 miles of Newark, N. J., preferred.

BO-176, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Flexible joint of modern design for underground Conveyor Belts required for the British Coalfields. Would entertain agency or manufacturing rights. Write

BO-202, AMERICAN MACHINIST
Aldwych House, Aldwych, London, W.C.2

COMPLETE TOOL & DIE JOB SHOP

To be sold as going business. Located about 50 miles from Chicago. In a good industrial city in Indiana. Equipment consists of ten lathes, two turret lathes, eleven grinders, nine drills, five millers, four shapers, presses, boring bars, compressors, and misc. Complete detailed information on request.

IRON & STEEL PRODUCTS, INC.
13498 S. Brainard Ave. Chicago, Illinois
"Anything containing IRON or STEEL"

WANTED — STEEL

Steel SAE 1010 in coils .093-.095 thick suitable for slitting to ¾" wide. 200 Tons required. Wire offerings to

KRISCHER METAL PRODUCTS CO.
631 Kent Ave. Brooklyn 11, New York

CUT-OFF MACHINE

DeWalt, Model ME-2. Dry Cutting Abrasive or Blade Cut-Off with 10 HP. Motor of 3/60/220-440 volts and including several saw blades. Near New.

TURRET LATHE

26"x7½" Libby-International Geared Head for M.D., with 22" Univ. Chuck and Taper Attachment. Ser. #C-7-7312. Good Condition.

GALBREATH MACHINERY CO.
Empire Bldg. Pittsburgh 22, Pa.

FOR SALE

No. 1230 Milwaukee Simplex Mill, late type machine, motor in base, table working surface 12"x48"
No. 33 Kempsmith Prod. Mill, motor driven table working surface 13"x42"
Pratt & Whitney Rotary Surface Grinder, motor driven diameter of magnetic chuck 10½"

H. H. PELZ MACHINERY COMPANY
627 West Washington Blvd., Chicago 6, Illinois

IMMEDIATE DELIVERY

5000 lb. Chambersburg Steam Drop Hammer

VICTOR MACHINERY CO.
135 So. Clinton Street
CHICAGO 6, ILL.

MDNA

WANTED

Engine Lathe 16" to 20"; Shaper 20" to 24"; universal mill.

Must be in good condition

W-224, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

● ● ● OUR INVESTMENT IS YOUR SECURITY

● ● ● SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

SHEARS & BRAKES

Lennox Splitting Shear, 8' throat, 3/4" cap., arr. M.
Lennox Bevel Shear, 3/4" cap., arr. M.D.
Dreis & Krump Apron Brake, 10' x 10 ga., #204, motor driven.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4 1/2 Bliss D.C. B.G. Forging 4" stroke (2).
#4 1/2 Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Hill 4" Bar Horizontal Table Type.
Horiz. #36 Landis-Rochester, 3 1/2 Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
No. 31 Lucas Horizontal Boring Mills 3".

DRILLING MACHINES

Cincinnati-Bickford 24", 4 spindle, #4 M.T. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.

RADIAL DRILLS

3' Dreses, 9" Rd. Column.
3' Arm 9" Col. Cincinnati Bickford
4' Arm 11" Col. Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford

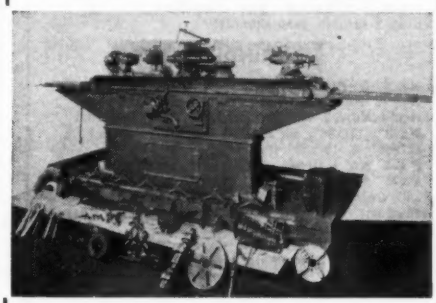
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
12" Heald Rotary Surface Grinder equip. with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1 1/2" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.
#2 Brown & Sharpe Surface Grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder, M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10 3/4". Distance between centers 60". Takes wheels to 12" dia.x1/2" to 1" thick. Longitudinal Table travel — 10 changes in rate; range 1 1/2" to 53 " per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (4).
No. 1 1/2 Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1 1/2 Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
Ames Precision Universal Bench Mill.
P & W 2 1/2" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller
No. 1B Hendey Universal, cone drive.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" N.-B.-P., Planer Shaper, M.D.

LATHES

Putnam 26 x 12 Heavy QCG, arr. for M.D.
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3 1/2" dia. hole in spindle (2).
LeBlond 14 x 6 Q.C.G.
Seneca Falls Tool Room 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper Att. (2).

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).

BENDING ROLLS

Stoll 4' x 4 1/2" Power Slip Roll cap. 10 ga.

SLOTTERS

Betts 36" Geared Slotter, Motor driven, 54" dia. Rotary table.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. 3/4" to 1 1/2". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

CLOSEOUTS

BORING MILLS
HORIZONTAL
2½" Universal, 2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL
66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

TURRET LATHES
Nos. 2A, 3A W.&S., 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"

GRINDERS
P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
B. & S. No. 3 Univ., No. 11, S.P.D.
12" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.

LATHES
McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16x8' Lod. & Ship. Grd. Hd., taper, M.D.
14"x6' Hendey, taper, collets
9" LeBlond Automatic
36x30' Putnam, M.D.
36x30' Putnam S.C.G., D.C.M.D.
36"x30' LeBlond, M.D. 32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
21x14' Sidney Q.C.G.
84"x28' Niles Bement Pond, 17' centers

AUTOMATICS
New Britain 1¼x7", 6 spindle Tim. Bear.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
Cleveland ⅞", Model M, 4 spindle
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.

PLANERS
72x56"x16' Gray, 4 heads, M.D.
30x30x8' American, 1 head
24x24x8' Cincinnati, 2 heads
24x24"x6' Flather, 1 head
32x32x10' Pond 1 head

SHAPERS
20", 24" G. & E., 20" Ohio, M.D.
16", 20", 26" Stockbridge

RADIALS
4', 7', 8' American Triple Purpose
5' Dreses Full Universal
8', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES
Ingersoll Planer type 36x36x12' 4 hds., M.D.
10" P. & W. Auto.
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B. & S. Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B & S. Universal
Rowbottom Cam Miller
K. & T., B. & S. No. 3 Dbl. overarm, Timken Bearings
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.

MISCELLANEOUS
10'x¾" Geo. Ohl Shear, M.D.
Gorton No. 18, 3S Engraving Machines
6 spindle Avey Drill, 15" overhang
800 ton coining press: McCabe ½" Flanger
Rochester No. 5B Hammer
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
Baush Multiple spindle drill
Burr Keyseater
⅝"x5' Plate Straightening Roll
4x4x⅝" Williams & White Angle Bending Roll
2x2x¼" Bliss Angle Bending Roll
10' Geo. Ohl Power Square Shear, M.D.

AARON MACHINERY CO.
MDNA MEMBER
45 Crosby St.
New York 12, N. Y.

MILES QUALITY TOOLS

AUTOMATICS
⅞" and 2" Cleveland "B"
1¼" & 1¾" Gridley 4-spindle "F"
4½" Gridley 4-spindle chucking, Model H
No. 454 New Britain, 4-spindle chucking
7" Baird 6-spindle chucking
14"x19" Fay abtomatic lathe

DRILLS
Sensitive, all makes and types
20", 21" & 24" Cincinnati upright
20" Barnes box column mfg.
22" Barnes 2-spindle all grd, self oiling
3½' American radial
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS
Nos. 7 & 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
16" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS
No. 1 G Grenby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing internal
6"x18", 12"x36", 16"x36" & 16"x52" Landis
10"x36" & 10"x50' Norton
8"x24" No. 1 Brown & Sharpe universal
6"x20" No. 10 Brown & Sharpe
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x48" Landis crankpin grinder
No. 60 Heald & No. 6 Landis cylinder grinders
No. 10 Blanchard surface

FORGING EQUIPMENT
No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES
12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x8' Hendey
18"x8' Sidney
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
8" & 12" Sundstrand Stub
15" Sundstrand automatic Stub

MILLERS & BORING MILLS
2½" Universal horizontal mill
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
Nos. 2 & 3 Kempsmith plain
Nos. ½ & 2 Van Norman plain
No. 12 Brown & Sharpe Mfg. elec. drive
No. 3 Sundstrand bed type mfg miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 3 Lees Bradner thread
4" Rice Barton double spline
48" Cincinnati automatic

SHAPERS & PLANERS
16" Gould Eberhardt shaper
16" American shaper
16" Steptoe shaper
24"x24"x6' Wood Powell planer
36"x36"x10' Hamilton planer
60"x60"x35' Gray planer

MISCELLANEOUS
6" Bignall-Keeler pipe threader
2" Landis pipe machine
3" Acme bolt threader, Landis head
6"x6" Hilles-Jones angle shear & Turn table
No. 7 Greenard arbor press, practically new
Arcade jar molding machine
Cleveland sand cutter
4" Stevens die slotter. New 1941

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICHIGAN

MOREY
Dependable Used Machines

BULLARD 24" Vert. Turret Lathe—with side head; R.P.

LANDIS 20"x220 Plain Cyl. Grinder—M.D.

GLEASON 3", 6", 11" Bevel Gear Generators—2 tool type

GLEASON 10" Spiral Bevel Gear Generator

GLEASON 15" Spiral Bevel Gear Generator

INGERSOLL 24" Cutter Grinder

INGERSOLL 26"x26"x12' Planer Type Miller

SAUNDERS 8-18" Pipe Threader

TREADWELL 12" Pipe Machine

LATEST TYPE MACHINE TOOLS — Built in 1942

DEFIANCE #25-A Horiz. Boring Mill—3¾" bar
GLEASON 12" Straight Bevel Gear Generator
GLEASON 3" Straight Bevel Gear Generators
MOREY No. 2G Plain Turret Lathe—1" cap.
MOREY No. 3 Univ. Turret Lathe—1½" cap.
MOREY No. 12M 2 spindle Vertical Profiler
ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt, A. C. motors

GISHOLT Precision Balancer

ESPEN LUCAS #138 Cold Cutting Saw—Cap. of blade 12"

SLEEPER & HARTLEY Coil Winder

CINCINNATI Gear Burnisher

THIS IS A PARTIAL LIST
Send me your specific inquiries

MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

EX-CELL-O Thread Grinder

Internal—Style 39A
New—1944—Used—2 Months

Wigglesworth Machinery Co.
203 Bent Street
Cambridge 41, Mass.

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x30	18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

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72" x 56" x 16' Gray 4 heads. M.D.

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1—36"x36"x12' Cinci. Dbl. Housing Planer 2 rail hds., 1 side hd., D.C. m.d.
1—56"x56"x18" Cinci. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.
1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

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POTTER & JOHNSTON 15" Shaper, M.D.
MARVEL No. 8 Metal Cutting Band Saw, cap. 18" x 18".
MILWAUKEE No. 2-B Double Over-Arm Plain Miller. Motor Drive.
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1—5' American triple purpose plain radial drill, motor on arm.
#4 Cincinnati High Power Plain Miller, S.P.D.
6' American Triple Purpose Plain Radial Drill, M.D.

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52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
60" Betts Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
#4 Cincinnati High Power Plain Miller, PRT.
42" Bullard New Era Vertical Turret Lathe.
#5 Cincinnati High Power Plain Milling Machine.

GRINDERS

12" x 96" Landis Plain, S.C.
18" x 85" Landis Plain Self contained.
#51 Oliver Drill Grinding Machine.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#1 Adams Gear Hobbers.
#1 Schuchart & Schutte Gear Hobber.

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96" x 96" x 36' Cincinnati 4 Hds. M.D.

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Grinder, 10' Bridgeport, Knife
Lathe, 20"x10' L. & S. Grd. Hd.
Miller, Universal, #3 Cincinnati, M.D.
Miller Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut.
Straightener, Sheet 42" W-F, M.D.

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AUTOMATICS, Cone, 1¼ & 1½" 4 spindle
AUTOMATICS, Gridley, ¾, 1¼, 1⅝ & 2¼" Model F, M.D.
AUTOMATICS, Gridley, 2¾, 3¼, & 4¼" S. S.
AUTOMATICS, Cleveland, 1¼, 1½, 2½, 3½ & 4½" M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, New Britain #22 & 24 Chuckers
AUTOMATICS, Potter & Johnston #5a & 6a
BORING MILLS, 24" Bullard, M.D.
BORING MILLS, Rockford, 3⅛" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6.
GRINDER, Brown & Sharpe #2 Universal M.D.
GRINDER, Brown & Sharpe #5 Plain, M.D.
GRINDERS, Cincinnati 12"x18" Plunge Cut
GRINDERS, Bryant #3 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
TURRET, Foster Universal, #2B, M.D.
MILLING MACHINES, #29 Ohio Universal, M.D.
MILLING MACHINES, #2B Rockford Universal, M.D.
MILLING MACHINES, Becker Vertical #5 & 6
MILLS, Briggs Production Type A&B
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13"x6' Willard Geared Head
14"x6' American Geared Head
14"x6' Pratt & Whitney, cone
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14"x6' Sidney, cone, motorized
16"x6' Lodge & Shipley, cone
16"x8' Reed, m.d.
15"x6' American Geared Head
18"x8' American Geared Head
18"x10' American Geared Head
20"x14' American Geared Head
24"x10' Boye & Emmes, cone, motorized
24"x10' Lodge & Shipley, cone, taper
22"x16' centers (22' bed) American 100 H.P. Super Lathe
24"x30' Schumacher-Boye, cone
26"x12' Boye & Emmes, cone
27"x16' LeBlond, cone
30"x12'6" Niles-Bement-Pond, m.d.
30"x18' American Geared Head, m.d.
30"x26' Lodge & Shipley Geared Head, m.d.
36"x10' Putnam, m.d.
36"x12' Wright, cone
36"x14' Boye & Emmes, cone
36"x26' Bridgeford Geared Head
42"x26' American Geared Head

TURRET LATHES

No. 1B Foster Universal, m.d., chucking
No. 2 Morey, m.d. in base, bar
No. 2 Pratt & Whitney Shaver, m.d.
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3A Warner & Swasey Universal, m.d., chucking
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2 spindle 3x36" Jones & Lamson Geared Head, m.d.
3¼" Cincinnati Acme Geared Head Flat Turret, m.d.
3½x32" Jones & Lamson Geared Head Flat Turret, steel gears
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18" Libby Type A Turret Lathe, m.d.
20"x7' American Turret Lathe, cone
20"x9' American Geared Head Turret, m.d.
24" Gisholt Turret, cone
24" Steinle Turret, m.d.
28" Gisholt Turret, cone
Woods Tilted Turret, model D, cone

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16" Hendey B.G. Crank, m.d. thru gear box

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3' American Sensitive, belt
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4' American Triple Purpose, m.d.
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4' Cincinnati-Bickford Plain, m.d. on arm
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, m.d.
5' Carlton Plain, m.d.
5' Cincinnati-Bickford Plain, m.d.
5' Cincinnati-Bickford Plate Hole Driller, d.c. motor
5' Dreses Plain, m.d.
5' Niles-Bement-Pond Full Universal, m.d.
5' Prentice Plain, m.d.
6' Cincinnati-Bickford Full Universal, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice, m.d.
6' Western Plain, m.d.
8' American Triple Purpose, m.d. on arm

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8" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
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No. 64-S Fellows Gear Shaper, m.d.
No. 3-26", 3-36", 4-36", 4-48", 6-60" Brown & Sharpe Spur Gear Cutters
No. 36B Gould & Eberhardt Gear Cutter, spur and bevel
48" Cleveland Hobbing Machine
24" Cross Gear Tooth Rounder
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Gear Rougher, m.d.
No. 2HS Lees-Bradner Spur & Helical Gear Grinders, m.d.

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Cleveland 2½" Bar Horiz.
Universal 3½" Bar Horiz.
Bullard 30" Vert. Turret
Bullard 36" Rapid Production
Bertram 42" Vertical
Bullard 100"—2 Head—M.D.

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Pratt & Whitney Gun Barrel Drills & Riflers

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Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator
Detroit Gear Grinders

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Norton 6x32, 10x24, 18x96
Baxter D, Whitney #23 Cylinder Grinder. Like New
Brown & Sharpe #11 Plain
Heald #70-A Internal
Heald #72-A-3 Sizematic. New 1940.
Blanchard #16-26" M.D.
Norton 15"x15"x72" Surface
Sav-Way Internal
Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Norton #2 Tool & Cutter
Pfauter Heb Grinder
Bryant #3B, 6, 12, 18 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
Badger #8 Disc Grinder, M.D.

LATHES:

Sidney 17"x8'
Lodge & Shipley 24"x10' g.h.
Johnson 30"x24'

MILLERS:

Cincinnati #5 Plain SPD
Milw. #3B Plain Double Overarm
LeBlond #3GH—Plain
Kempsmith #4 Maximiller, Plain
Brown & Sharpe #10, new 1940
Rice-Barton Spline Millers
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Becker Model C, Vert.
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln

MISCELLANEOUS:

Boring Machine—Coulter Diamond Borer
Chambering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnson #6-C
Hammer—Bliss 300 Lb. Drop
Header—W-F ¾" Ball
Header—W-F #1 & #2—SSSD
Shaper—P & W 6" Vertical
Shear—Marshalltown #88 Rotary Bevel. M.D.
Tapper—Threadnut #2
Swager—Dayton #3½
Thread Roller—W-F ½" cap.
Upsetter—Acme 2" Steel

PLANERS:

Gray 36"x36"x8'
Cincinnati 36"x36"x20'
Cincinnati 48"x48"x20', 3 Head
Gray 84"x72" 18', 4 Head

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W-F 20 Ton Rack & Pinion
Robertson 170 Ton Hyd. 16' High

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7/8" Cleveland Model M, four spindle
Model H Gridley Chucking, four spindle

DRILLS

No. 11 Natco 16 spindle
No. 3 Defiance, s.p.d., #5 Morse Taper
No. 24 Foote-Burt, s.p.d., #4 Morse Taper
20" Barnes Camelback, single spindle
24" Sliding Head, Single Spindle
26" Rockford sliding head, single spindle
24" Barnes Camelback
4' Cincinnati Bickford Radial, s.p.d.
Stecher Deep Hole, m.d., 2¼" capacity

GEAR CUTTERS

No. 5—60" Brown & Sharpe
No. 3—26" Brown & Sharpe
No. 6 Fellows Gear Shaper, m.d.
No. 13 Brown & Sharpe
No. 12 Barber Colman Hobber
96" Gleason Spur & Bevel Gear Planer
30" Rochester Gear Tooth Rounder

GRINDERS

12" Heald Rotary Surface, s.p.d.
#75 Heald Internal
No. 72A3 Heald Gagematic
No. 60 Heald Internal
10 x 24 Norton Cylindrical
10 x 36 Norton Cylindrical
10 x 30 Landis Cylindrical
20 x 144 Landis Cylindrical
76" Rogers Knife Grinder

LATHES, ENGINE

12" x 6' Hendey, g.h.
20" x 6' Lodge & Shipley, c.d.
18" x 8' Superior, c.d.
27" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, g.h.

LATHES, TURRET

42" Bullard New Era V.T.L.
No. 3A Warner & Swasey, g.h.
26" Libby, g.h.
No. 5A Potter & Johnston, g.h.
No. 2 Warner & Swasey
No. 1 Foster, c.d.
No. 0 Foster, c.d.

MILLS

No. 4 Cincinnati Plain, s.p.d.
No. 3 Cincinnati Plain, s.p.d.
No. 1½B Milwaukee, s.p.d.
No. 1½A Rockford Plain, c.d.
No. 2½B Milwaukee Vertical, s.p.d.
No. MM1 US Multi-Miller, m.d.
No. 2 Standard Hand Mill
No. 7 Becker-Lincoln Type
4" Pratt & Whitney Spline
No. 5 Becker Vertical, c.d.
42" Bullard Vertical Boring, m.d.

MISCELLANEOUS

12" Williams Pipe Machine
4" Stevens Vertical Slotter
16" Betts Vertical Slotter
No. 2 Baker Keyseater

PLANERS & SHAPERS

17" Smith & Mills, c.d.
36" x 36" x 10' Woodward & Powell Dbl. Head
32" x 32" x 10' New Haven Planer, 1 head
24" x 24" x 8' American Planer, 1 head

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51"x22' FITCHBURG ENGINE LATHE, Internal Face Plate Drive; D.B.G.; Loose change gear; M.D. 8' bed extension.
36"x17' AMERICAN GEARED HEAD QUICK CHANGE GEAR LATHE; 11" between centers; AC Motor Drive.
30"x16' FIFIELD, LCG, Back Geared, Motor Drive.
30"x12' LEBLOND, Quick Change Gear, 2½" hole, M.D. with motor.
18"x8' AMERICAN, Q.C.G., Dble. back grd.
16"x8' L.C.G., with 4-jaw chuck, 5-step cone, back grd.
17"x6' CINC., SEMI Q.C.G., Compound rest, 5 step cone.
16"x6' L. & S., Q.C.G., Dble back grd., taper att.
16"x6' PRATT & WHITNEY, geared head, S.P.D., T.A.
16"x6' HENDEY, G.C.G., Motor Drive, T.A.
16"x7' BLAISDELL, Loose Change Gear, Back Geared, M.D.
14"x6' L. & S., Quick Change Gear, with taper att.
14"x6' LEBLOND, Q.C.G., Back Grd., 15½" Swing.
14"x6' BRADFORD, Grd. M.D.; 14"x4' L. & S., Back Grd.
12"x8' LODGE & SHIPLEY, Q.C.G., with relieving and taper attachment, Dble Back Grd.
2—12"x6' LODGE & SHIPLEY, Q.C.G., Actual Swing 15", Dble. Back Grd.
12"x5' P. & W., L.C.G., 1" spindle hole.
8" SUNDSTRAND STUB LATHE, Single Pulley Drive, P.F.
30' PIT LATHE, FACE PLATE 156", Internal face plate drive.
PIT LATHE, 86" swing over ways, 115" between centers.

TURRET LATHES

1—No. 4 WARNER & SWASEY, 1½" capacity, Back Geared, Power feed.
6—No. 2-A WARNER & SWASEY, Motor Drive.
No. 1 WARNER & SWASEY, Motor Drive, ⅝" capacity.
28" NILES BEMENT POND, 4¼" hole, Power feed, M.D.
26" LIBBY UNIVERSAL, T.A. Bar feed, 7½" hole.
No. 16 GISHOLT SIMPLIMATICS, 21" and 23" Swing, S.P.D.
No. 6 BROWN & SHARPE, Fric. Hd., 2-1/16" hole, B.G., M.D.
No. 7 FOSTER UNIVERSAL, Motor Drive, Back Grd., P.F.
2—No. 5 FOSTERS, Fric. Hd., B.G., P.F.
18" LIBBY, Grd. Hd., 3-9/16" hole, Motor Drive.
No. 3 FOSTER & WOODS.
No. 2 BARONS & OLIVER.
JONES & LAMSON GRD. HEAD, A.C. Motor Drive, 2¼"x24", Bar Feed; 2¼"x24" CHUCKERS (2).

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PLAIN: No. 5-B BROWN & SHARPE AC. M.D.
No. 4 LEBLOND, Hvy. Duty, 16¼x68" table, M.D.
No. 4 CINCINNATI, 16½x64" table, M.D.
No. 2 HENDEY NORTON, back grd., P.F.
No. 2 B. & S. HEAVY, Sgle. back gear, P.F.
No. 15 GARVIN B.G., 12¾x50" table
PRODUCTION: 3-Pract. New ‡MMI U.S. Multi-Mills.
No. 9 B & S Taper, 6x21½" table, M.D.
No. 45 Productomatic, rotary table.
13—Pract. New 18" Cincinnati Automatics.
HENDEY LINCOLN TYPE, P.F. 10¼x26¼ table.
10" Pratt & Whitney Semi-Auto., 6⅝"x18" table.
PLANER TYPE AND SLAB: 42x36"x12' Beaman & Smith Openside; 42"x42"x13' Ingersoll Slab.
UNIVERSAL: No. 1 Kempsmith; No. 1-B K&T.
VERTICAL:
No. 2 Brown & Sharpe, B.G., 10¼x38½" table.
No. 2½-B Kearney & Trecker, 14x70" table.
Vernon Vertical; High Speed, 6x21" table, M.D.
THREAD: 6x72" Pratt & Whitney, M.D. with motor.
6x48" Pratt & Whitney; No. 3 Lees Bradner, B.D.

DRILLS

RADIAL

6 Ft. AMERICAN UNIVERSAL, Box table, Motor Drive thru gear box.
6 Ft. AMERICAN 14" column, geared motor drive, with box table.
4 Ft. AMERICAN, No. 4 M.T., 11" column, geared motor drive thru gear box with motor.
3 Ft. FOSDICK, No. 4 M.T., 10" column, power feed.
3 Ft. AMERICAN, Maxi-Speed Sensitive, motor on arm.

FLOOR

34" BARNES, Back Geared, No. 4 M.T. Power feed.
32" PRENTICE No. 5 M.T. Power feed, 3¼" dia. spindle, M.D.
25" SYNDER, No. 4 M.T. P.F., Back Grd.
3—24" BARNES GEARED, round table and stationary head, M.D.
20" WEIGEL, No. 4 M.T., B.G., P.F.
16" AVEY, No. 2 M.T. 12x13" table; 14" HENRY & WRIGHT, No. 2 M.T.
No. 14 NATCO MULTIPLE SPINDLE, Arr. 20 Spindles, P.F., Belt drive.
No. 12 NATCO MULTIPLE SPINDLE, with 12 Spindles, M.D.
8-Spindle MULTIPLE, No. 4 M.T., M.D., 60" bet., Power feed.
8-Spindle FOX, Motor Drive.
6-Spindle LELAND GIFFORD, No. 2 M.T.; 4-sp. BARR, B.B. No. 1 M.T.
2, 3 and 4 Spindle AVEYS, 8" overhang, M.D.
4-Spindle Adjustable Rail MOLINE HOLE HOG, 8x38".
25" CANEDY-OTTO, 3-Sp., No. 3 M.T., P.F., 19½x65" Table, Coolant Pump.
2—No. 2 COLBURNS HEAVY DUTY, 11" travel; No. 4 M.T., M.D.

GRINDERS

INTERNAL

No. 72 HEALD SIZEMATIC INTERNAL GRINDER, Hydraulic Feed, motor drive.
No. 52 GREENFIELD HYDROIL INT. GRINDER (2), Hydraulic Feed, Ball Bearing Spindle.

CYLINDRICAL

8x30" MODERN Cyl., Self Cont., Coolant Pump and Tank.
6x12" STORM, Power Feed, M.D., Coolant Pump.
No. 11 BROWN & SHARPE, 6x32", M.D.
3" LANDIS RACE.
No. 22 LANDIS, 12"x34", Pump and Pan.
10"x36" LANDIS; 6x32" NORTON, with Coolant Pump.

SURFACE

15"x15"x96" NORTON Surface; M.D.; A.C. Motor, Coolant Pump and Pan; 2 Mag. Chucks.
No. 11 ILLINOIS SURFACE, 6x24" table, M.D. with motor.
6x18" NORTON HYDR. SURFACE, M.D., Coolant Pump.
12" PARSONS-ARTER ROTARY SURF., with Coolant Pump.

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1—No. 1 WILMARTH & NORMAN, belt drive; with Univ. Grinding att.
2—No. 1 WILMARTH & NORMANS, M.D., head and tailstock.

UNIVERSAL

No. 12 CINCINNATI, Motor Drive, 12"x36".
BATH UNIVERSAL, 10" Swing, Power Feed, belt drive.

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16-A Fellows Gear Shaper

36" Bullard New Era Vertical Turret Lathe

‡2 Brown & Sharpe Universal Grinder 14" x 30"

14" Pratt & Whitney Model "B" Vertical Surface Grinder, 25 hp motor-on-spindle

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Dexter 8880

4" Bar Lucas Horizontal Boring Mill, M.D.
5" Bar Newark Horizontal Boring Mill, 8' bed, M.D.
3—‡7 Fellows Gear Shapers, M.D.
‡17 Barbor Coleman Heavy Duty Gear Hobber, can take a hob up to 5¾" dia., M.D.
10x30 Norton O.D. Grinder, self contained, 10 yrs. old
8" Bullard Mult Au Matic, 12 spindle
‡40 Cross Gear Tooth Rounder, M.D.
‡3, ‡4 Horiz. and Univ. Milling Machines, M.D.

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Have You Read the Latest MDNA Bulletin on Redistribution of Surplus Machine Tools?

Every dealer in used and rebuilt machine tools, every industrial plant, will be affected by the method our government finally selects in disposing of surplus machine tools. The used machine tool dealers associated in MDNA have analyzed this problem thoroughly. Their ideas have been incorporated in the latest Association Bulletin No. 6. We invite every dealer in used and rebuilt machine tools, as well as industrial executives, to write us for a copy of this bulletin.

MACHINERY DEALERS NATIONAL ASSOCIATION

RANDOLPH K. VINSON, *Executive Director*

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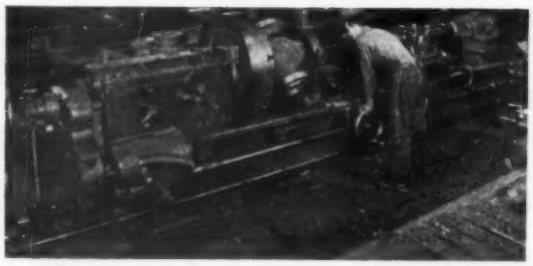

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36" Gould & Eberhardt Single Cutter Automatic Gear Cutter, suitable for jobbing work, being replaced by Hobber now in in use. Price—$500.00 f.o.b. cars Cleveland. Delivery immediate.

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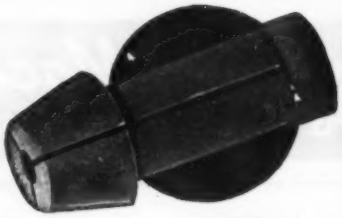

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GRINDER: Excelle Thread ⅀31 (1943)
GRINDER: Landis Plain Cyl. Type C 6"x18" Hyd. (1943)
GRINDER: Landis Brake Drum 23" x 36"
GRINDER: Pratt & Whitney Vertical 8" Chuck
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LATHES: (2) Adams Short Cut Geared Head 14" x 4'
LATHE: American Geared Head 18 x 8', Taper Q.C.
LATHE: McCabe, G.H., 42" x 25' Q.C., H.D.
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MILLER: Plain Horiz. ⅀3 Le Blonde, Vert. Att.
MILLER: Plain Horiz. ⅀3 Cinc. dial (1941)
MILLER: Plain Horiz. (⅀1) ⅀26 Becker Brainard
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#4 Cincinnati Universal, 3 step D.B.G. M.D.
#4 Cincinnati Hi-Power Plain, S.P.D.
#4 Cincinnati Plain, 3 step D.B.G. M.D.
#4B Brown & Sharpe Plain, Single P.D. M.D.
#4 Milwaukee Plain Standard Knee Type, Heriz. M.D.
#3 Cincinnati Plain Miller, D.B.G.
#3 K.T. Milwaukee Plain, M.D. 1939
#3½ Pratt & Whitney Duplex, Geared, P.F. to table, M.D.
#3 Van Norman, S.P. 1942 Model
#3 Cincinnati Vertical, Single Pulley, High Power.
Model C Becker Vertical, P.F. to rotary table, M.D.
#2 Leblond Plain, Back Geared, M.D.
Pratt & Whitney Automatic, P.F. to table.
#12 Brown & Sharpe Pred. M.D.
#7 Becker Lincoln Type.
#2 Davenport Plain, M.D. 3 Slot. Table 9½"x36½"
#3½ Fox, Back Geared 6¾"x6½"
6"x132" Pratt & Whitney Thread Miller
Lees Bradner Thread Miller, 12"x36" 1941 mod.
36"x36"x10' Ingersoll 4 hds. Planer Type. M.D. adjustable heads.
#2 Brown & Sharpe Vertical, P.F. to table, M.D.
#08 Cincinnati Vertical, M.D. 1941
#A.D. Becker Vertical, S.P.
#0Y Brown & Sharpe, P.F. to table
#2B Kearney & Trecker Heriz. S.P.
#3 Cincinnati Vertical Hi-Power, S.P.
#2 Brown & Sharpe Univ. Heriz.
Cochrane & By Vert. Univ.
No. 3 Brown & Sharpe
No. 2A Brown & Sharpe Universal M.D.

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#2 Brown & Sharpe Surface
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